FLOWERING TREES

M S RANDHAWA

730

India—The Land and The People

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M. S. RANDHAWA

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CHAPTER I

A PLAN FOR BEAUTIFYING INDIA

FOR A HEALTHY and balanced development of a nation, wealth in the form of material goods is, no doubt, necessary, but a beautiful environment is just as essential. Colourful trees and flowers play a great part in making the environment beautiful and in refining the minds of the inhabitants.

Bioaesthetic planning may be defined as a conscious planning of the flora and fauna with the object of beautifying the country.

Bioaesthetic planning embraces both the animal and plant sciences, botany and zoology, and may be further defined as planned ecology of living beings from the artistic and aesthetic points of view. It includes the planting of ornamental flowering trees along city roads, in parks, public places and compounds of houses both in towns and villages, and the development of national parks for the preservation of beautiful, non-carnivorous animals, and the creation of bird sanctuaries. The object of a bioaesthetic plan for India is the encouragement of the planting of selected ornamental flowering trees in our towns and villages, the protection of beautiful, harmless birds like wild ducks, egrets, geese and *sarus* cranes by legal declaration of our lakes as bird sanctuaries, and the preservation of graceful animals such as black bucks, blue bulls, *sambhars* and spotted deer, which are being ruthlessly exterminated, in national parks and zoological gardens in the vicinity of our cities.

Bioaesthetic planning, of course, embraces landscape gardening also but it is a much wider term. The whole country is susceptible to bioaesthetic planning, provided a consistent policy is followed and a persistent effort made over a long period. The bioaesthetic planner is a master-artist whose canvas is the entire country and whose pigments are the beautiful flowering trees. He paints the canvas of the

countryside in rich colours—blue, yellow, orange, scarlet, red and pink. The blue jacarandas, yellow *amaltas*, orange-scarlet *gul mohurs*, scarlet colvilleas, red erythrinas and pink lagerstroemias are with which he paints the side-walks of roads, the platforms of railway stations, the canal banks and the compounds of houses and public buildings. His objective is to lay them out in a pleasing pattern and thus create an attractive picture.

With the success of our Five-Year Plans, people in India have become plan-conscious, and, in fact, planning has become the rage of our epoch. All thinking people realize the danger and wastefulness of 'go-as-you-please and devil-take-the-hindmost' competitive unplanned economy which we inherited. All the world over, people have begun thinking of the future needs of the community and have realized the value of planning. The idea of planning appeals to the imagination of the people who appreciate clear thinking, for it is scientific. It is also the quickest method of developing the resources of an underdeveloped country. The idea of planning is not novel to the biologist who deals with the classification of plants and animals and their orderly arrangement in phyla, classes, families, genera and species, thus creating order out of chaos. In fact, Carl Linnaeus was a very great planner indeed, for he cleared so much confusion and created an orderly biology.

Bioaesthetic planning is the projection of the systematizing and planning mentality of the biologist onto the field of everyday life. The planning of our cultural and aesthetic life is a necessary concomitant of the planning of our social and economic life. While we are planning our industries and agriculture, we can hardly ignore the environment of human beings.

Though a beautiful pattern may result, by chance, out of haphazard efforts of individuals, it cannot be called planning for beauty. Planning has been described by Professor Abercrombie as 'a conscious exercise of the powers of combination and design, and not a question of unconcerned growth, even though the latter may produce fortuitously happy results'.

About 200 years ago in Europe and about 100 years ago in our country, the common man was afraid of mountains, lakes and forests

and looked at them with a feeling of horror. It is only in the twentieth century that educated people began to admire the beauty of the mountains and forests. In India, the educated classes are under a heavy debt to Wordsworth for inculcating in them the love of nature. There is in some of us an indiscriminating and irrational adoration for nature. People who have never grown a herbaceous border of annual flowers in their own house burst out into panegyrics on seeing a clump of anemones or potentillas in the hills. It is far from my intention to decry the beauty of alpine flowers in the Himalayan meadows as compared with the annual flowering plants in our gardens in the plains. On the other hand, I hold that in the magnificent setting of the Himalayan snows, a planned alpine garden will look much better than anything nature has ever produced. Untamed nature is disorderly, chaotic and wayward. Man has been constantly fighting his environment. He battles with nature to produce a semblance of order. He clears the jungles, breaks virgin soil for cultivation, diverts the courses of rivers, makes canals and embankments for irrigation and converts wasteland into parks and gardens. While in some cases he has produced ugliness by his haphazard, uncontrolled and misdirected action, in other cases he has been able to improve upon nature. Who can deny the beauty of the poplar-lined roads of France, the vineyards of the Rhine, the tulip fields of Holland, the saffron terraces of Kashmir and the hedgerows of the English countryside? Those who admire the beauty of the English countryside forget that it is the result of hard work of many generations. Describing the evolution of the English countryside, Lancelot Hogben writes, "What generally gains admiration for the beauties of the English countryside is not nature as such. Untouched nature is generally monotonous. English parklands and hedgerows, and many of our woodlands are the result of human interference, sometimes by the deliberate action of enthusiastic pioneers of bioaesthetic planning like John Evelyn, and sometimes as relics of past cultivation." Similarly, the wonderful landscape gardens of Japan are the result of the toil of generations.

However, broadly speaking, man's battle with nature and his envi-

ronment has been haphazard and there has been no conscious planning and direction of his efforts. The explanation is simple. Individuals who set about consciously changing and planning their environment are rare. On the other hand, the large majority of people are content with their mode of living and their everyday environment. Moreover, it is just a rare chance that the odd individuals who change things are in a position of power where they can execute their plans. This is more true of India than of any other country in the world. Excepting the Moghuls who came from the arid region of Central Asia and were more garden-conscious than Indians and left behind wonderful terraced gardens and planted grand avenues of *chenar* (*Platanus orientalis*) along the banks of the Jhelum in Kashmir, our country has been practically untouched, so far as bioaesthetic planning is concerned. Maybe, our comparative neglect of gardening is due to the luxuriant jungle vegetation which surrounds our villages. But now this should be a help rather than a hindrance in the planting of flowering trees in a planned manner.

Town planning and bioaesthetic planning should go hand in hand. Orderly and planned planting of ornamental trees can be seen at its best in new towns with wide roads, flanked by shady footpaths, well laid out public parks and squares rather than in congested old towns with narrow, crooked streets. Our old towns offer little scope for bioaesthetic planning. Firstly, they contain no open places suitable for planting, and secondly, their streets and roads are very narrow. The planting of flowering trees in an old town appears like draping an old, haggard and ugly woman in a brilliantly coloured new *saree*, which merely throws her ugliness into greater contrast. Beautiful new clothes are displayed to best advantage on a good-looking young woman, and bioaesthetic planting too can be seen at its best in new residential quarters which are growing up on the outskirts of old towns or in new cities like Chandigarh.

Town planning is a precondition for bioaesthetic planning. We have allowed our towns to develop like mushrooms on a dung heap without any plan or order. In our country, *laissez faire* has really run amuck and the results have been most unfortunate. Ugly, ill-ventilated houses joined together in monstrous piles along narrow, crooked

lanes—that is how our ancient towns like Amritsar, Lucknow, Banaras and Patna appear to an outsider whose eyes are accustomed to Western orderliness. An aerial view reveals them as pieces of a jigsaw puzzle mixed up in a crazy pile; and not a patch of green in these prison-like piles of masonry. These houses may have been suitable in the insecure times of the Middle Ages when security rather than ventilation was the guiding principle in our domestic architecture, but in the present social context they appear anachronisms and fossils of a social and economic order which disappeared long ago. In these old towns, we see a reflection of our disorderly and indisciplined social and economic life. They may appear romantic to foreigners who come to our country in search of oriental mysticism and magic but are certainly unfit for the healthy growth of a nation. It is time we realized that we have had enough of these stinking streets. The younger generation must be educated in a new mode of living. We must improve the environment in our towns by introducing modern architecture and landscaping.

A very pertinent question arises about the future of these old towns. What should be done with these ancient insanitary slums? Some would recommend wholesale demolition. But that is an extreme view, idealistic rather than practical. We should try to improve them as far as practicable. These old towns are in need of drastic surgery. We must decongest old residential areas by compulsory acquisition of suitable central housing areas, and after demolishing the ugly houses thus acquired, we should develop parks and open spaces on the sites thus vacated. Improvement Trusts have done useful work in some cities of India, but the pace of progress is snail-like and painfully slow, considering the need for rapid urbanization and an alarming increase in the population of our cities. Parks are necessary, but swimming-pools should also be constructed for the recreation of citizens in the hot weather and, incidentally, for irrigating the trees and lawns.

A garden suburb should be our ideal in this warm country. Vertical development is unsuitable, considering the summer heat; and flats are positively uncomfortable in the hot weather. Moreover, the development of motor transport has greatly facilitated horizontal and peripheral development of cities. As far as possible, the growth of

these garden suburbia should be planned in a concentric manner, as this will mean economy in fuel consumption for motor vehicles. With the evisceration of slummy quarters, the development of parks and tanks in the decongested areas and controlled development in the suburban areas by introducing architectural and facade controls, we can make our old towns also look fairly attractive.

Towns developing along the communication lines serve as production or distribution centres. Our old towns developed along the banks of rivers which were the main channels of communication in the past and served as distribution centres where the villagers exchanged their agricultural produce with hand-made articles made by the artisans of the towns. These towns were built around forts in which the kings lived, surrounded by their nobles and soldiers. They were surrounded by stone or brick walls for the sake of protection. The ancient walled towns packed with buildings raised without much of planning appear like disorderly piles. The narrow streets were designed for the needs of pedestrians, pack animals like mules and donkeys, and country bullock-carts, whose speed may be taken as five km per hour. With the increase in population and changes in the technique of warfare as well as transport, the walled city became an anachronism. The ancient town packed with buildings and people ultimately bursts, and garden suburbia in the shape of so-called civil stations and model towns are created.

So the problem arises : what should be our ideal in this new town development? The garden city should be our ideal. The Welwyn Garden City in England and Chandigarh in the Punjab provide examples which may profitably be followed in the development of new population centres.

With electrification which will come in the wake of the hydro-electric schemes, trolley-buses will be most suitable for transporting people to their places of work from their homes in garden suburbs. For our city of the future, the Le Corbusier model with many-storeyed offices and factories linked with the garden suburbs by means of bioaesthetically planted roads will be most suitable. People will work in the production hub of the city during daytime and will disperse again into the garden suburbs in the evening, enjoying life in healthy, quiet, noise-free, dust-free and smoke-free surroundings.

CHAPTER II

PLACES WHICH SHOULD BE BEAUTIFIED

PUBLIC PLACES WHICH belong to the community as a whole rather than individuals should have priority in bioaesthetic planning. A large number of persons, especially those who are unable to afford private gardens of their own, will thus be able to enjoy the sight of beautiful flowers. Public parks and squares, public roads, platforms of railway stations, compounds of hospitals, universities, colleges and schools, ancient historical buildings under the supervision of the Archaeological Department, compounds of courts, office buildings of Municipalities and District Boards and dak bungalows of the Public Works Department, the Canal Department and the District Boards are the places in towns which are susceptive of bioaesthetic planning and should claim preference in our programme of beautifying our towns and cities. Proprietors of hotels and banks and owners of new houses should also be encouraged and given all assistance in the planting of ornamental trees.

A railway station is the entrance gate of a town. An outsider coming to a town for the first time receives his impression of the place from the railway station. An unfavourable first impression requires a good deal of correction later on. A traveller on a long journey forms his opinion about a town, which he is too busy to see, from the architecture of the railway station and the appearance of its platforms. He may condemn a town merely because he passed through a ghastly railway station. A railway station with a grim exterior will be unworthy of any beautiful town. Platforms can also be sometimes frightfully drab. Avenues of *amaltas*, Persian lilac, peltophorum and lagerstroemias will lend them a touch of colour, relieving them of their monotony. A platform without trees will add to the discomfort of passengers who often have to wait for long for their trains. Shade is

always welcome in summer. The necessity of planting the platforms and approaches of railway stations with beautiful flowering trees is yet to be fully appreciated. We have still to plan the planting of platforms of thousands of railway stations.

There is another reason why we should make the platforms of our railway stations gay with flowering trees. Millions of persons daily pass through railway stations in the course of business. Platforms of railway stations are more noticed by the people than any other public place. Only a few go to gardens to acquaint themselves with flowering trees, while they all have to see the platforms and approaches of railway stations. By planting flowering trees on platforms of railway stations, we will not only be beautifying them but will also be educating the citizens in bioaesthetics. The railways will thus be making a genuine contribution to the cultural life of the country. The Indian Railways should grow their own nurseries for the supply of seedlings to station-masters for planting on platforms. It is necessary, however, that the station-masters develop a sense of appreciation for flowers and trees. This they will if they are given lectures on bioaesthetics in the course of their training.

We are living in a shrinking world, which is rapidly becoming one. India is no longer an isolated country with vast jungles full of snakes, tigers and elephants. The aeroplane has annihilated distance, and the size of the earth has shrunk to a fifteenth of what it was before the Second World War in terms of the time dimension. This will mean greater contacts among the peoples of different countries, and a tremendous increase in tourist traffic in India.

So far, we have been having cold-weather tourists only from Europe and America, but in future we will have tourists from all parts of the world in the spring and summer and autumn months too. Moreover, electric fans, air-conditioned railway trains, motor-buses, houses and hotels have reduced the discomfort of living in a hot country to a great extent, and the plains of India are no longer unbearably hot and uncomfortable.

The Himalayan meadows carpeted with brilliant alpine flowers, the snow-covered peaks of the Himalayas with their pine-scented forests and the brilliantly coloured rocky trans-Himalayas will draw lovers of

natural beauty like a magnet from all parts of the world. What will they see in the plains on their way to the Himalayas? If we transform the land into a colourful place by planned planting of flowering trees, the visitors will carry back happier impressions. Just as the Japanese invite foreigners when cherries blossom in their country, we can also call them when the bauhineas are covered with a mantle of purple and mauve flowers in March, and when our roads become a blaze of colour with flowers of *gul mohur*, *amaltas* and peltophorum in May.

Gate-keepers who live in neat little houses along the railway lines near the gates at railway and road crossings should also be asked to plant a couple of flowering trees near their houses. How beautiful these places will appear! Not only railway passengers, but people passing through these places in cars and other conveyances will also be able to feast their eyes on the beauty of the blossoms of the pink cassia, *kachnar*, *amaltas* and lagerstroemia. Those who have to wait at the railway crossings when the gates are closed will have something more beautiful to espy and contemplate than railway signals and complaint-books.

Ancient buildings and ruins under the supervision of the Archaeological Department afford endless opportunities for bioaesthetic planting. Those who are in charge of this Department have already shown imagination and foresight in this type of work. The Deer Park in Akbar's tomb at Sikandra in Agra district is an instance. However, the planting of flowering trees must be pushed further. The bare hills around Fatehpur Sikri should be planted with *amaltas*, which is highly drought-resistant, with the additional advantage of not being eaten by goats. Besides *amaltas*, *dhak*, erythrina, *barna*, yellow silk cotton tree and *semal* may also be planted in pure formations on different hillocks. Hills swathed in yellow, deep yellow, scarlet, and red colours of the flowers of these trees will look really fascinating. The temples at Sarnath, near Banaras, the Taj Mahal at Agra, the ancient temples at Konarak, Bhubaneshwar, Badami, Aihole and Pattadakal, the caves of Ajanta, Ellora, Nasik, Karla, Bhaja and Mahabalipuram and the Mandu Fort in Madhya Pradesh, all provide scope for planned planting of ornamental flowering trees.

Towns which have canals and small rivers are particularly suited to bioaesthetic planting. The banks of the canal in Madras and the banks of the Gomti river at Lucknow should be planted with *Lagerstroemia flos-reginae*, *L. thorelli* and other moisture-loving trees. It would be desirable to encourage canal irrigation in the other cities as well, for it will provide an incentive for the growing of gardens and also for the planned planting of ornamental trees. Headworks of canals can also be developed into pleasure resorts with a little effort.

In India, rivers such as the Ganga, the Jamuna and the Kaveri are regarded as particularly sacred, and along their banks we see a number of temples and ghats. *Kadamba* and *Ashoka*, the sacred trees of Krishna and Sita, if planted at these places of worship, will add colour and charm.

Hotels and dak bungalows which are usually fenced and have well-protected compounds, and some of which have irrigation facilities too, come within the scope of the tree-planting programme. The boulevards of coastal cities like Bombay and Madras can be made into a symphony of colour by planned planting of suitable flowering trees.

We should also not neglect the villages, where village schools, *panchayatghars* and temples can be planted with ornamental trees. In the Punjab, the villagers plant *bakain* (Persian lilac) around the bullock-runs of wells fitted with Persian wheels. These clumps not only provide shade for bullocks and men, but also appear very beautiful in March when they are covered with sweet-scented, lilac-coloured flowers. Village community houses (*panchayatghars*) which are jointly owned by the village and are usually under the supervision of village-level workers and the elected representatives of the village provide ample scope for the planting of ornamental trees. Small nurseries of flowering trees can be raised in the compounds of village schools and *panchayatghars* and can serve as foci of tree-planting activities.

CHAPTER III

BEAUTIFYING A NEW CITY

CHANDIGARH HAS COME UP as the new capital of the Punjab. It comprises an area of 15 square miles on a plateau, 1,300 feet above sea-level with the Sivalik and the blue Kasauli hills in the background. Eminent town-planners and architects from France, England and India were invited to prepare a town plan. Albert Meyer, Corbusier, assisted by Pierre Jeanneret, E. Maxwell Fry and Jane B. Drew, finally produced the well-known Chandigarh Plan. The city was planned for a population of 150,000 persons to start with, but eventually, it will accommodate about half a million people.

Corbusier sums up the ideals of town planning thus:

> "The sun, space and verdure are the ancient influences which have fashioned our body and our spirit. Isolated from their natural environment, all organisms perish, some slowly and some quickly, and man is no exception to this general rule. Our towns have snatched men from essential conditions, molested them, starved them, falsified them, embittered them, crushed them, even sterilised them, the third generation to live in great cities tends to sterility. Fashioned throughout millennia by the conditions of nature, man cannot with impunity disrupt the natural order. Shut up in masonry walls and conditioned to the smell of petrol fumes, men in large towns lead a cramped and unhappy life, deprived of the essential joys of life—sun, space and verdure. Unless the conditions of nature are re-established in man's life, he cannot be healthy in body and spirit.
>
> "The fundamental elements are : accord with the laws of nature; harmony of actions in the recurrent cycle of the solar day of 24 hours; experience of the 'essential joys'; an intensity in

> consecrated work and in consecrated leisure; definition of the metier of the contractor; exploitation of the architectural revolution accomplished in the laboratory by the nineteenth and twentieth centuries; the idea of unity regulating the doctrine of the 'built domain' and its necessary overhauls; the intervention of the 'law-giver' reuniting nature with the built work, in the land, in the province, in the region, in the town, determining the scales and types of built volumes and tracing new routes; the whole in conformity with the law of the land."

In search of the sun, space and verdure, man drifts from the ancient town and establishes himself in garden suburbia. Ultimately, the so called garden towns also develop and expand, reducing the outskirts of the towns to miserable shabbiness. Nature melts under the invasion of roads and houses. Horizontal garden towns in the grip of the tentacles of the ancient city are ultimately re-absorbed and the promised seclusion becomes crowded settlement.

According to Corbusier, the real solution lies in the vertical garden city in which the superimposed buildings rise above the park which contains amenities such as sports grounds, creches, primary schools and clubs. By the concentration of a large number of dwellings in one building, considerable area of open ground is liberated. Thus the site is effectively enlarged and merged into the countryside. The dwelling unit allows the organization of common services such as water supply, electricity, air-conditioning, medical services, sports and education. The corridor street lined with houses on both sides is abolished, and in the place of confusion, architectural amplitude of simple splendour results. The town is no longer a senseless pile of stone and masonry but becomes a park, and thus man and nature are harmonized. Avenues of trees, sometimes three to five rows thick, provide green walls, and grouping of trees in the form of rectangles, squares and circles create green rooms.

These are the ideals of town planning, as propounded by Corbusier, and it is necessary to understand them in order to appreciate the basic concepts of town planning in Chandigarh. In a country with a hot summer, multi storeyed residential flats are a

positive discomfort, unless they are air-conditioned. Hence in Chandigarh, the ideal of the vertical garden city has been partially accepted, in the sense that residential buildings are double-storeyed, whereas the office buildings are multi-storeyed. Chandigarh, thus, represents a compromise between the ideals of the vertical and the horizontal garden cities.

According to Corbusier, towns are biological phenomena. They have a brain, a heart, lungs and feet like human beings. It is on this conception that the city of Chandigarh has been planned. The 'Capitol' group of buildings comprising the Secretariat, the High Court, the Legislative Assembly, and Government House constitute the head. Spacious parks and green belts which run through the city provide the lungs. The network of roads for vehicular traffic and footpaths for pedestrians constitute the circulatory system. Commercial buildings and shops represent the heart. The industrial area in the east with its population of workers and education institutions on the west represent the limbs.

Now let us examine the special features of housing at Chandigarh. In North India with its severe winters and hot summers, there is need of warmth in winter and protection from the hot sun in summer. The general plan of the houses in Chandigarh has been evolved by orientating the houses in such a way that the hot summer sun is kept out, whereas the winter sun comes right into the rooms. Various elements like sun-breakers and brick *jallies* have been introduced, which have given a character to the buildings of Chandigarh. The sun-breakers have been devised to intercept the sun and to insulate the interior of the house from heat. Large glass windows admit into the house the warmth of the sun in winter. Moreover, by the use of these glass windows the interior of the house is brought effectively in touch with the surrounding landscape. Seen through the glass, the hills, the trees and parks become a permanent extension of the home, and man enjoys the essential joys of life -- the sun, space and verdure. Sunlight is most essential for health. As Corbusier says :

> "From the physical point of view, the human being is nothing other than a 'transformer of solar energy', and of the numerous

forms taken by this energy, it is light, from infra-red to ultra-violet, that constitutes its most indispensable nutriment. For man directly absorbs it through his skin by means of a million papillae turned to the luminous vibrations like tiny resonators of precision. Furthermore, man absorbs it indirectly through his food, vegetable or animal, a veritable store of light. Darkness and the sickly light of towns, broken by smoke and dust, are potential causes of tuberculosis, rickets and nervous breakdowns.

"The 24-hour cycle and the radiance of the sun alone can teach us how to build. Behind them, the entire cosmos reveals itself, approaches man and is ready to clasp him to its bosom, like a prodigal son who is to be restored to his rights."

The site of the young city was practically bare with the exception of a few clumps of mango trees which have been preserved. Chandigarh, like a new-born baby, was waiting to be clothed in a mantle of vegetation. The urgency of planting the capital was realized by the State Government.

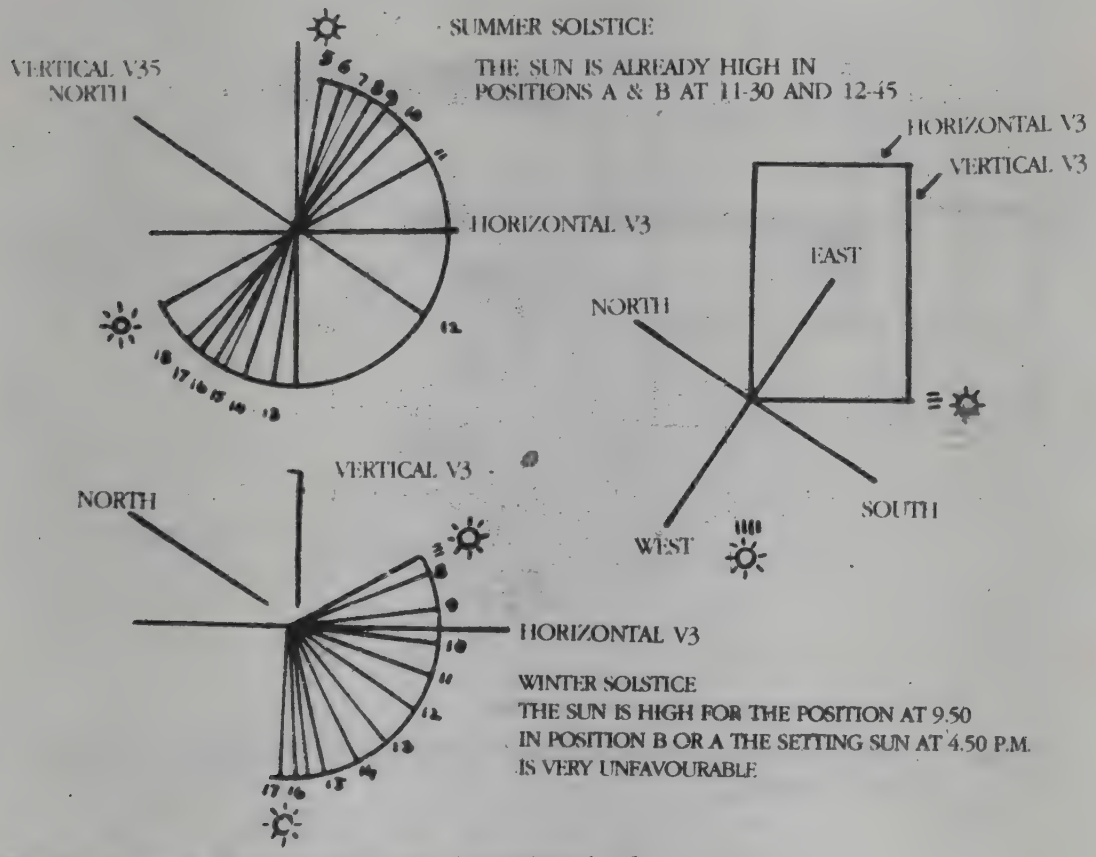
Let us analyse and classify the elements which constitute the problem of landscaping and tree-planting in Chandigarh. These resolve themselves into three : firstly, the urbanistic elements which require tree-planting; secondly, the selection of trees and their classification according to the shape of the crown and colour of flowers; thirdly, the manner and arrangement of trees, i.e., the architectural disposition of the elements of tree-planting.

Urban elements affected by tree-planting are the roads, urban spaces with elements of architecture such as the Capitol, University and commercial centres and free urban spaces.

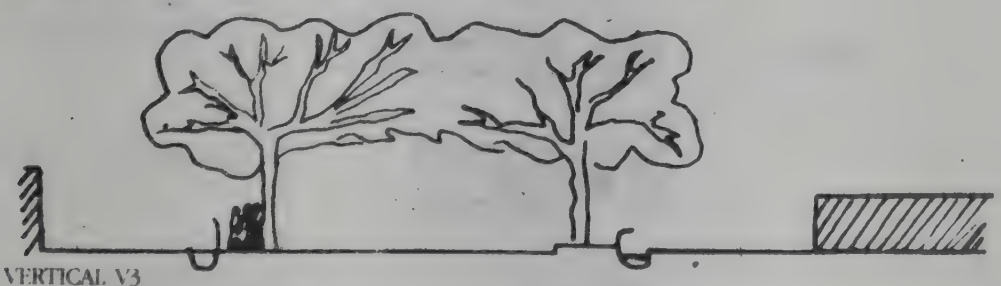
Along the roads trees are planted in single rows, in double rows or in multiple rows. In the garden belts and other free urban spaces, the trees are planted either singly or in homogeneous groups, or in heterogeneous groups or in large forest plantations.

The avenue of the Capitol constitutes a heavy-traffic automobile highway, with parallel bands of parking, a large pavement on each side with shops and arcades and high buildings. Also outside this and

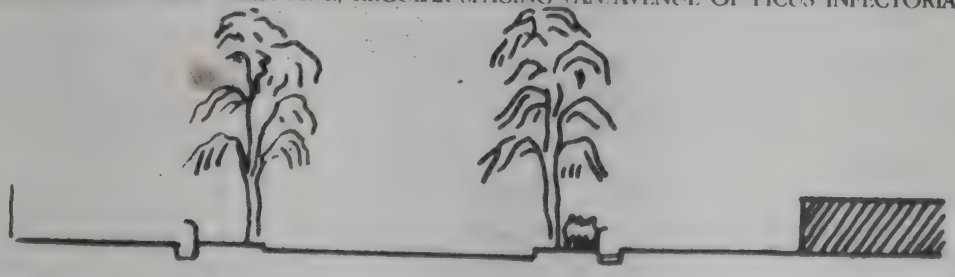
Diag. 1 Effect of insolation at Chandigarh (Le Corbusier)



Diag. 2 Shady avenues for vertical and horizontal V3 which get maximum heat of the sun (Le Corbusier)

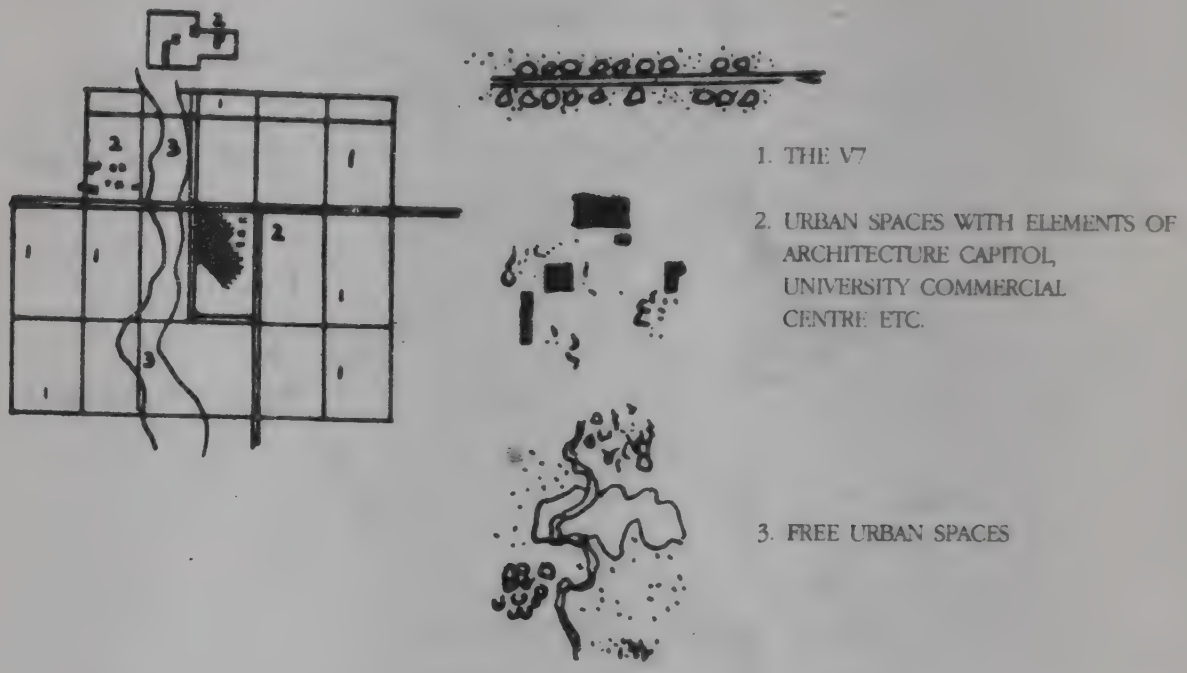


VERTICAL V3
EVERGREEN FOLIAGE (TO AVOID UPKEEP FROM SWEEPING).
FROM: SHAPE 2. DEVELOPMENT OF
HORIZONTAL BRANCHES IN ORDER TO ENABLE TRIMMING
TO FORM A TUNNEL
ARRANGEMENT: ROW EACH SIDE, REGULAR SPACING (AN AVENUE OF FICUS INFECTORIA)

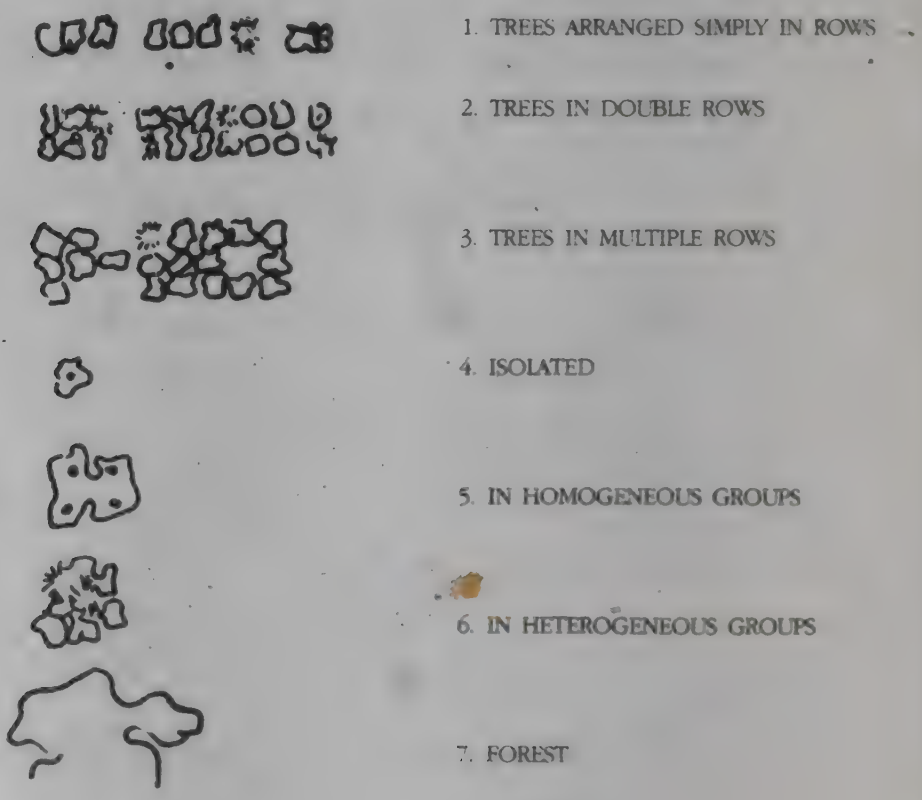


HORIZONTAL V3.
EVERGREEN TREES (TO AVOID UPKEEP FROM SWEEPING)
FORM: SHAPE 6.
ARRANGEMENT: REGULAR SPACING, ONE ROW EACH SIDE

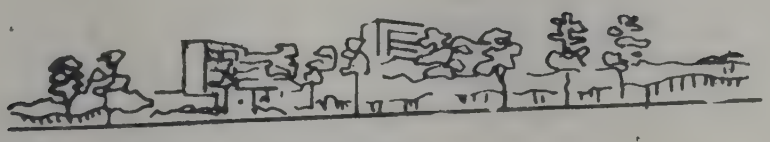
Diag. 3 Urbanistic elements in Chandigarh affected by tree planting (Le Corbusier)



Diag. 4 Architectural concept of the elements of the tree planting in Chandigarh (Le Corbusier)


1. TREES ARRANGED SIMPLY IN ROWS
2. TREES IN DOUBLE ROWS
3. TREES IN MULTIPLE ROWS
4. ISOLATED
5. IN HOMOGENEOUS GROUPS
6. IN HETEROGENEOUS GROUPS
7. FOREST

Diag. 5 Tree planting in high-rise buildings in Chandigarh (Le Corbusier)

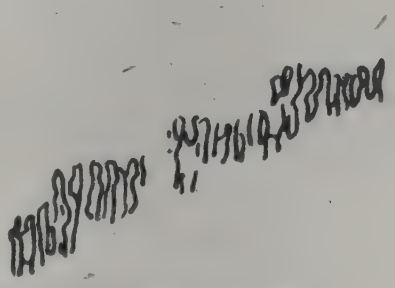


1. TREES WITH HIGH TRUNKS LIGHT FOLIAGE AND EVERGREEN
2. TREES WITH HIGH TRUNKS THICK FOLIAGE DECIDUOUS
3. TWO-STOREYED BUILDINGS
4. BAND SEPARATING TWO ROADWAYS (ANTI-HEADLIGHTS)

SHAPE 6 SHAPE 6 SHAPE 1.2.3.6.

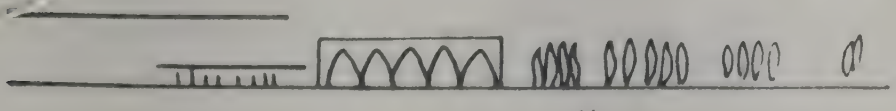
Diag. 6 Green walls and green rooms created by tree planting (Le Corbusier)

IN CERTAIN PARTS OF THE CAPITOL THE HORIZON WILL BE SHUT OFF BY GREEN WALLS (TREE WALLS) M. AND GREEN ROOMS WILL BE CREATED.

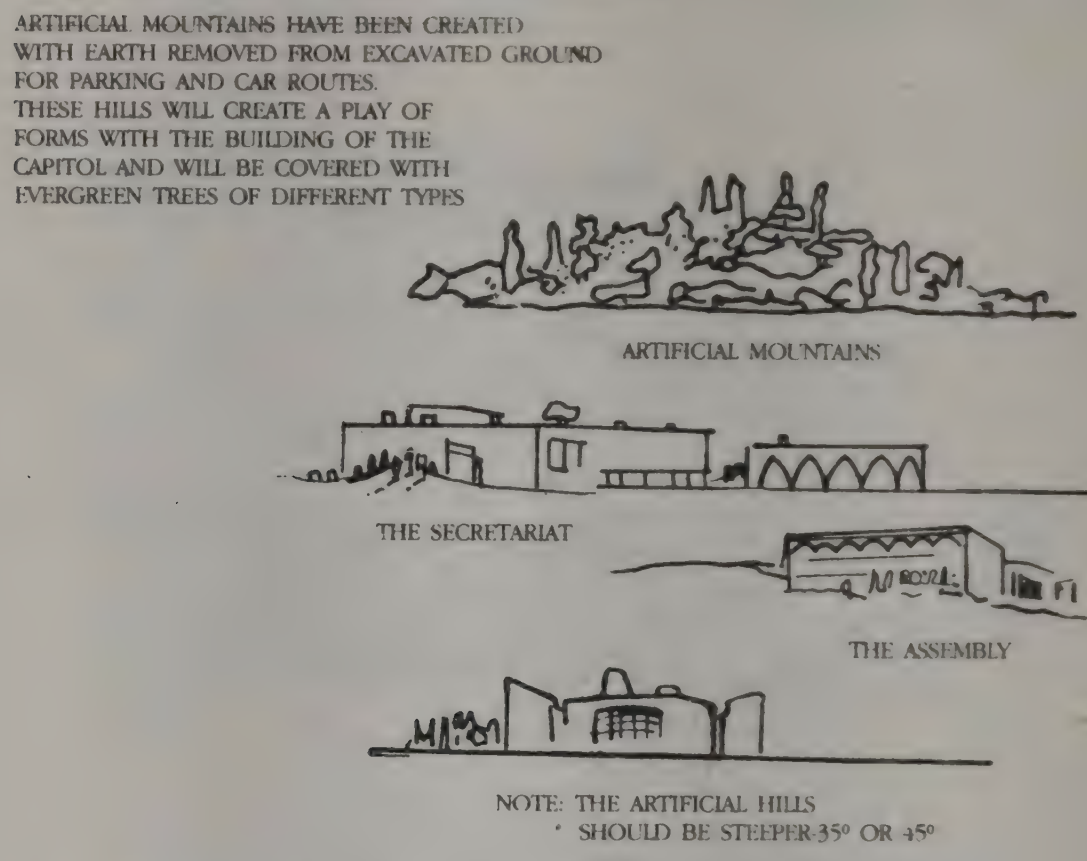


THE ARRANGEMENT OF GREEN ROOMS

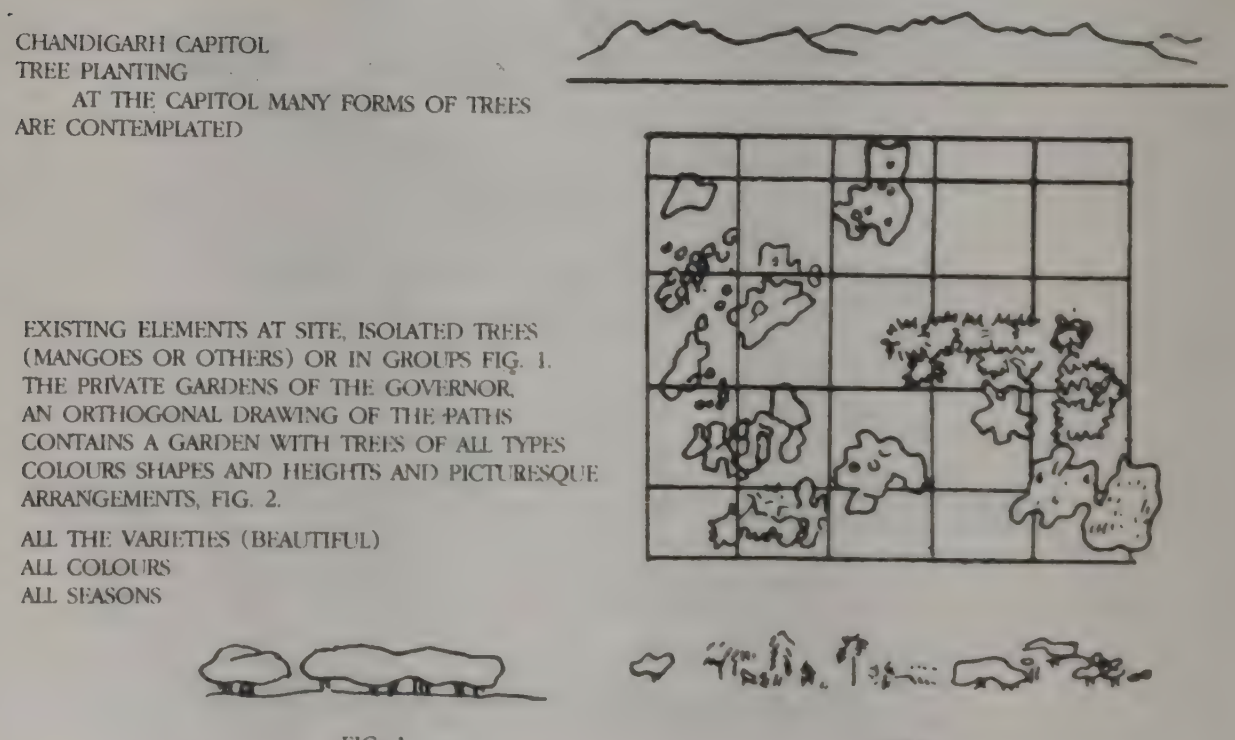
SECRETARIAT



Diag. 7 Artificial Hills in Capitol complex covered with trees of different types (*Le Corbusier*)


ARTIFICIAL MOUNTAINS HAVE BEEN CREATED
WITH EARTH REMOVED FROM EXCAVATED GROUND
FOR PARKING AND CAR ROUTES.
THESE HILLS WILL CREATE A PLAY OF
FORMS WITH THE BUILDING OF THE
CAPITOL AND WILL BE COVERED WITH
EVERGREEN TREES OF DIFFERENT TYPES
ARTIFICIAL MOUNTAINS
THE SECRETARIAT
THE ASSEMBLY
NOTE: THE ARTIFICIAL HILLS
SHOULD BE STEEPER-35° OR 45°

Diag. 8 Tree planting in Capitol complex; a variety of beautiful trees with colourful flowers (*Le Corbusier*)


CHANDIGARH CAPITOL
TREE PLANTING
AT THE CAPITOL MANY FORMS OF TREES
ARE CONTEMPLATED
EXISTING ELEMENTS AT SITE, ISOLATED TREES
(MANGOES OR OTHERS) OR IN GROUPS FIG. 1.
THE PRIVATE GARDENS OF THE GOVERNOR,
AN ORTHOGONAL DRAWING OF THE PATHS
CONTAINS A GARDEN WITH TREES OF ALL TYPES
COLOURS SHAPES AND HEIGHTS AND PICTURESQUE
ARRANGEMENTS, FIG. 2.
ALL THE VARIETIES (BEAUTIFUL)
ALL COLOURS
ALL SEASONS
FIG. 1.
FIG. 2.

parallel to it is the eroded valley. This road has been planted with green grass and ornamental shrubs like the bougainvillaea. Footpaths for pedestrians are shaded by four to five rows of trees.

On the one hand, it seems useful to demarcate the automobile highway by a border of high trees and, on the other, to unite with one glance the entire width of the avenue in question, the shops, pedestrians, parked cars and the localized contacts with the eroded valley and the leisure space. It is equally necessary to cover the pedestrians' promenade with shade along the shops.

For the car route, a single or double row of trees with high foliage will permit the eye to travel across. This will be with light and evergreen foliage to avoid the need for sweeping.

For pedestrians, a multiple row of trees with very heavy deciduous foliage is required so that the sun's rays may pass through in winter. There must also be some evergreen trees with dark and glistening foliage.

This arrangement will contrast the height, the thickness, the colours and the permanency of the foliage, and will explain the various functions of this essential artery of the city.

Trees with regular shape such as cypresses, the Lombardy poplar, *ashoka*, and chorisia are suitable for formal planting schemes. In the interior roads where the shape of the crown is not so important, trees with beautiful flowers and foliage such as *kachnar*, jacaranda, coral trees, *amaltas*, *gul mohur*, pink cassia, silver oak, and Pride of India may be planted.

The countryside with these trees is interesting and pleasant throughout the year.

In summer, the trees provide shade and in winter sunshine, as the deciduous trees permit the sun's rays to pass.

Though a large number of trees, both exotic and indigenous, have been planted in Chandigarh, the old trees, particularly mangoes, whether growing singly or in groups, clumps of date-palms, and groves of the Flame of the Forest have been retained in the green belts, thus creating an illusion of age.

Apart from preservation of old trees, beautiful effects have been created by planting trees in groups. Trees have been planted in the

form of squares and circles, and the rest have been planted in clumps in such a manner that the tallest trees are in the middle and the smaller trees are at the periphery, thus creating pyramids of greenery. Groups of ougeinia, pink cassia, jacaranda, callistemon, *amaltas*, Pagoda-tree, *ashoka*, lagerstroemia, double-flowering peach and cherry have been planted in this manner. Bamboos are particularly suitable for this type of planting. These are of various types—giant bamboos, dwarf bamboos, thick bamboos, thin bamboos and green, yellow-stripped bamboos.

At the bottom of man's heart reigns his boundless yearning for the primordial forest. In the forest, man is brought in contact with his ancestral environment. The deep shade and silence of the forest provide an opportunity for introspection and meditation, and one forgets the worries of life. Trees realize their personality, and perform their duty only when they are planted in numbers. This is particularly true of trees like the eucalyptus, *kadamba*, chir pine and the yellow *siris*. A row of eucalyptus trees appears miserable, and one gets a feeling that something is missing and the planting is incomplete. Plant them in large numbers, and see what a beautiful effect they create. Then, at once, everything is transformed; the sky and light recover their first deep meaning; an oasis of coolness, silence and shade is created. Some of the parks in Chandigarh were planted exclusively with the forests of the chir pine, eucalyptus, *kadamba* and yellow *siris* (*Albizzia procera*). These are all giant trees which are gregarious and when grown in large numbers create a beautiful effect.

The cathedral-like alignment of the shafts of chir pines shooting towards the sky, smooth, pure and inflexible with their round and plump crowns, is a reminder of the Himalayan forests with their peace and silence. *Kadamba* groves with their silence and perfume remind us of the happy forests of Vrindavan where Krishna roamed with the milkmaids, and no doubt they will provide the gladness and freshness of the rainy season to the citizens of Chandigarh. Forests of yellow *siris* with their smooth, light yellow and barkless boles emit a strange golden light; there is a warm and russet glow at their base, and a blue ethereal mist covers their top.

With the earth removed from the excavated ground from the

Capitol site, artificial mountains have been created. These hillocks have created a play of forms with the buildings of the Capitol, and have been covered with evergreen trees of different types.

Bioaesthetic planning is closely connected with town planning. Before the towns arose, there were groves of trees, meadows, moving horizons, hills, mountains, rivers and lakes. By building disorderly piles of houses, many beautiful views have been obscured. This has been avoided in Chandigarh by staggering the setting of houses in such a manner that the mountain view is not obscured even at the ground level. Trees have been carefully chosen with due regard to the colour of flowers, the beauty of foliage and the shape of crown. In addition to utilitarian and aesthetic aspects, trees in the city constitute an effective buffer against dust and noise, and also act as wind-breaks. Moreover, when planted properly they link up individual masses of buildings in a harmonious whole, and enhance their architectural appeal by presenting a foil of texture, colour and form by way of contrast.

Chandigarh is one of the most carefully planted cities of the world. The residential areas are brightened up by masses of blossoms. In the hot months of summer, heavy masses of dark-green leaves provide a refreshing shade. Under the shadow of the blue mountains of the Kasauli Range, the great blocks of buildings stand shaded by the green walls of trees, the true friends of man. From the top of the buildings the vast horizon is seen providing a play of colours in all seasons. In the monsoon, which is the most pleasant season in Chandigarh, clouds appear in all directions; they are dropping rain in the east, their dark masses are visible in the south, and the scarlet of the setting sun is tinging the horizon in the west. The green domes of *peepal* and mango trees have been retained to provide a touch of the countryside. Thus we find in Chandigarh that the town and the country are blended, the marriage of the tree and the building has taken place; the result is harmony, and the link between nature and man is established.

CHAPTER IV

BEAUTIFUL AVENUES FOR TOWN ROADS

INDIA HAS THE largest number of flowering trees in the world, indigenous as well as exotic, which can be utilized for beautifying towns. On account of the diversity of climate and soil, we can grow almost any tree from the temperate rhododendrons and double flowering cherries to the tropical amherstias and browneas. Compared with our opportunities, our achievements are, however, puny. Barring a few cities like New Delhi, Lucknow, Patna, Chandigarh and Bangalore, we have made little use of beautiful trees in our country.

Even in countries in the temperate zone, where modern Western civilization has made comparatively greater progress, it is only recently that attention has been drawn to beautifying towns by planting trees. Except France and Italy, where lombardy poplars are extensively grown, we find little beauty on the roads of European cities. With the intensive house-building activity which followed the second World War, people in England were awakened to the necessity of planting their town roads with beautiful trees. The outer streets of Birmingham show careful planning with liberal use of trees and grass. In Liverpool, grass is grown even between tram lines with flanking hedges.

The French immigrants introduced the lombardy poplar in Canada, and it is commonly grown as a roadside tree in the cities of Quebec and Montreal. The maple, which is the national tree of Canada as oak is of Germany, is extensively grown as a roadside tree in Canada and the eastern U.S.A. Of all the cities in the temperate regions, the city of Washington is, perhaps, the most aesthetically planted with trees. The amber, yellow and coppery tints of maples, oaks and chestnuts in the Rock Creek, harmonizing with the yellow colour of buildings in the

autumn months of October and November, leave an indelible impression on one's mind. Japanese double-flowering cherries and peaches, dogwood trees with white and pink flowers, and fragrant magnolias lend grace to the State buildings and monuments of this beautiful American city.

However, as compared with tropical and subtropical countries, the tree-material available to the inhabitants of temperate countries is comparatively prosaic. Trees with brilliant flowers and birds with gay plummage occur only in the tropics and subtropics. Temperate countries of Europe and America have hardly anything to match the blazing *gul mohur* avenues of Kandy, the brilliant blue jacaranda avenues of Johnnessburg, the pink cassia avenues of Chandigarh and the graceful palm avenues of North African towns.

Considerable attention has been paid to the layout of avenues in Cairo. Along the long road leading from Gizeh to the Pyramids, we find a beautiful avenue of alternating *gul mohur* and eucalyptus. Jacarandas are planted extensively along roadsides and also date-palms mixed with clipped box-like trees. Clumps of date-palms are grown in the backyards of houses. In Morocco, the French colonials planned the roadside avenues of the towns in an artistic manner. In the main thoroughfare of Rabat, a dwarf variety of date-palm is grown in the form of avenues with grass beds on both sides. Triangular plots in the town are planted with Persian lilac and *Schinus terebenthifolius* which bears red berries in profusion in November. The compounds of private houses are enlivened by orange flowers of *Bignonia venusta,* magenta-coloured bougainvillaeas, and brightblue shrubs of *Plumbago capensis.*

The main objective of town planning is to make towns look more efficient, healthier and more beautiful. We require not only spacious well-planned streets designed as a unit but also well-planned roads and parks with a planned planting of ornamental trees. What is desired is *order,* which is not the same thing as uniformity. Dead uniformity with the same stamp placed on all the houses and trees in the whole town will be as undesirable as our present confusion with everyone following his own sweet will and spreading ugliness. What is desired is an orderly variety with not only houses in the street

following a particular design, but trees as well, planted and replaced from time to time according to a plan.

For our towns, we are not only in need of a 'Road Plan' for traffic but also a 'Tree Planting Plan' for beautifying them. For every town of importance, a 'Landscape Plan' should be drawn up and rigidly adhered to. For new roads, it is comparatively easy to plan the planting of unfamiliar flowering trees, but it is the old roads which present a problem. The wholesale cutting down of existing trees will render them shadeless. The only practical approach is to replace dead, decaying and old trees according to a definite scheme.

In the Banaras University, planned beautiful avenues of flowering trees have disappeared or have become patchy on account of the absence of a landscape plan, and also because of the lack of aesthetic taste in those who manage them. It is true, all cannot do the job of planning colour and beauty, but painters and artists can come to our aid to plan and execute. Aesthetically gifted arboriculturists who have an eye for colour and beauty should be selected and given training in agricultural colleges in garden designing, and in the theory of colour harmony and colour contrast. The artist should be introduced to the garden, and the arboriculturist should be initiated into the arcana of the art school. Both will be gainers from practical experience. While the fresh breeze of the garden and the glamour of erythrinas, colvilleas and *amaltas* will invade the studio, freshening up the minds of the artists, the garden will also gain from the impact of imaginative and sensitive minds, who will be able to convey their experience to the common man in the form of beautiful pictures. Thus, the blaze of *gul mohurs*, the glory of colvilleas and the splendour of *kachnars* will brighten up our homes also throughout the year, even when other flowers are dead and gone.

While shade and economic utility should be the criteria for selecting trees for national, State, and district roads passing through the country, different types of trees are required for town roads. For roadside avenues in towns and cities, shade and beauty are the sole criteria which we should consider while selecting trees. Unfortunately, as the large majority of our flowering trees are deciduous, there are very few trees which combine shade with beauty

of flowers. Where the space available is limited and only one row of trees can be grown on each side of the road, flowering trees like *gul mohur, amaltas,* jacaranda, erythrina and spathodea may be grown alternating with shade trees like *Eugenia operculata.* The choice should be restricted to one species only for each street. Very tall trees like eucalyptus and millingtonia and trees with spreading crowns like banyan are unsuitable for town roads, because they interfere with electric wires. Medium-sized trees like *Eugenia operculata,* and *pakur (Ficus infectoria),* which are extensively grown in New Delhi, are ideal for shade. But for beauty's sake we have to select other types of threes.

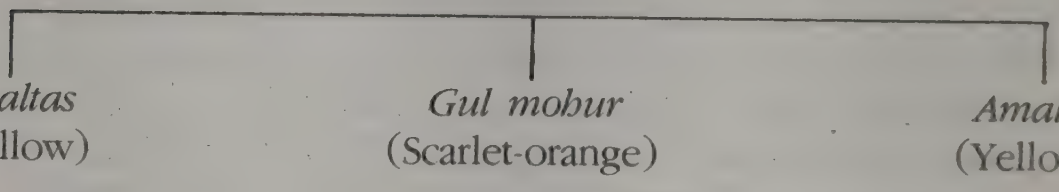
Double avenues of trees are a necessity in big cities with wide roads. In an ideal road for a traffic centre of the metropolis, provision should be made for fast-moving traffic such as motor cars and lorries and also for slow-moving traffic such as horse drawn vehicles, bullock-carts and bicycles. Thus a road is to be divided into four sections for slow and fast traffic on each side, seperated by islands planted with grass and shrubs in the middle and flanked by footpaths for pedestrians. Double avenues of trees on the outer sides of the footpaths are recommended: an outer row of shade trees and an inner row of ornamental flowering trees. The outer row should be composed of evergreen shade trees with dense foliage such as tamarind, *polyalthia longifolia, Eugenia operculata, Putranjiva roxburghii, moulsari (Mimusops elengi), Ficus retusa, neem (Melia azedarach)* and *pakur (Ficus infectoria).* The function of the outer row is of providing shade only. These trees *should be planted in pure avenues and not in mixed patches.* Pure avenues of one species provide a beautiful skyline and a pleasing effect due to uniformity in size and shape of the crowns of the trees of the same species, whereas a mixture creates an ugly confusion with a jagged skyline. The inner rows should be of ornamental flowering trees only. The outer rows of shade trees will provide shade for pedestians on the footpaths, and at the same time will furnish a green background for the pink, red, crimson and yellow flowers of the flowering trees. The trees in both the rows should be planted at a distance of 30 feet from one another with trees in opposite rows alternating.

In every big town, we find triangular pieces of land at the junction of roads. To safeguard against traffic accidents, these plots are not leased for building purposes but may be planted with shrubs like bougainvillaeas.

Beautiful roads and well-planned parks and squares bring beauty of nature to urban areas.

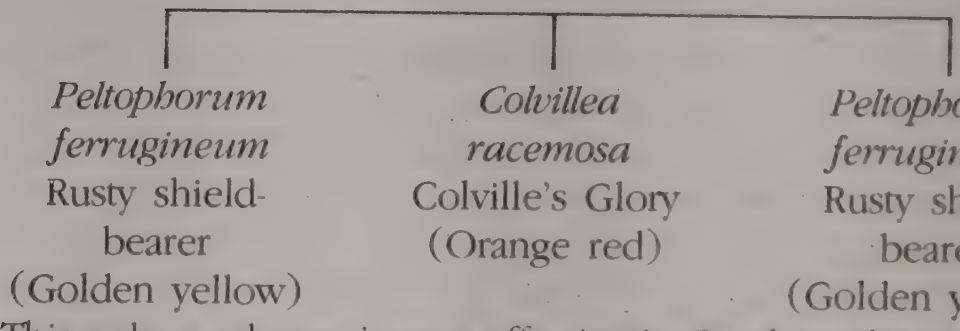
While most of the flowering trees look beautiful when planted in pure avenues, there are some species which flower at the same time; the colour of their flowers also harmonizes. Hence these trees appear more effective when planted side by side. Some of the flowering trees which flower in the same season are grouped below in schemes with due regard to colour harmony and are recommended for planting on city roads:

SCHEME NO. 1



This is very striking colour scheme, the rich yellow colour of *amaltas* flowers contrasting with the scarlet-orange colour of *gul mohur* flowers in May when both the trees are flowering.

SCHEME NO. 2



This colour scheme is very effective in October when both these trees are flowering, and a colour effect similar to that in scheme No. 1 is produced.

SCHEME NO. 3

Jacaranda mimosaefolia (Blue)	*Grevillea robusta* (Yellow)	*Jacaranda mimosaefolia* (Blue)

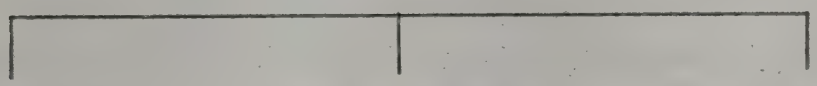
Both these trees flower together in April and produce a beautiful colour effect. Blue flowers of jacaranda are soothing in the glare of April.

SCHEME NO. 4

Spathodea nilotica Fountain trees (Orange crimson)	*Erythrina indica* Scarlet erythrina (Scarlet red)	*Spathodea nilotica* Fountain trees (Orange crimson)

Both these trees flower in March when they are a blaze of colour.

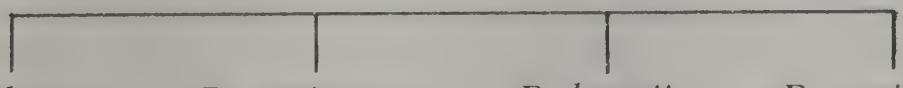
SCHEME NO. 5



Cassia nodosa (Pink)	*Cassia marginata (Terracotta red)*	*Cassia nodosa (Pink)*

These trees flower in May and June when a very mellow colour scheme of pink and terracotta red is obtained.

SCHEME NO. 6



Bauhinia variegata (Purple mauve var.)	*B. variegata* (White var.)	*B. krugii* (Light magenta)	*B. variegata* (Light pink var.)

This colour scheme which is composed of three varieties of *Bauhinia variegata,* pink, white and purple mauve, and light

magenta *(B. krugii)* is recommended for dust-free roads of residential areas. All these bauhinias blossom in a leafless condition from the middle of February to the middle of March when they look like huge bouquets of pink, white, purple and light magenta flowers. This is a very pleasing colour scheme and is highly recommended.

ORNAMENTAL TREES SUITABLE FOR TOWNS ROADS

Foliage trees for outer avenues	Flowering trees for inner avenues
Averrhoea Carambola	*Cassia fistula*
Callistemon lanceolatum	*Bauhinia purpurea*
	B. variegata
Anthocephalus cadamba	*Colvillea racemosa*
Eugenia operculata	*Peltophorum ferrugineum*
Polyalthia longifolia	*Spathodea nilotica*
Putranjiva roxburghii	*Jacaranda mimosaefolia*
Sterculia alata	*Poinciana regia*
Pithecolobium saman	*Lagerstroemia flosreginae and*
	L. thorelli
Melia azadirachta	*Grevillea robusta*
Tamarindus indica	*Gliricidia maculata*

CHAPTER V

AVENUES FOR NATIONAL AND STATE HIGHWAYS

EMPEROR ASOKA WAS one of the earliest Indian monarchs who planted shady trees on roads and in public places. The Moghuls, too, realized the necessity of shade on the roads which they constructed. But there was no conscious planning; and the *peepal*, banyan and *pakur* trees were indiscriminately mixed with *neems*, tamarinds and *mahuas*. It was only in Kashmir that they showed some preference for planning and planted magnificent avenues of *chenar* along the banks of the river Jhelum, which can be seen at their best at Gandharbal and Matan on the way to Pahalgam. Conscious planning of avenues in Europe dates from the sixteenth century when Francis I of France adopted a scheme of planting Lombardy poplars along the main roads of France. The beautiful French roads with their grand avenues of spire-like poplars are the result of his effort, and his successors carried on his policy over a long period. The early French emigrants carried the Lombardy poplar to Canada, and we find the graceful tree extensively planted along roadsides in the province of Quebec.

A plantation plan for our national, State and district highways is urgently needed. At present, our roads are planted by the P.W.D. engineers who are ignorant of trees. Ultimately, the planting of new trees and the replacement of dead trees are left to *malis* alone who plant any tree which comes handy. The result has been unfortunate and our roadside avenues have become a mixture of odd trees.

On account of indiscriminate plantings and thoughtless replacements, our roadside avenues have become very much mixed. Owing to the difference in the shape of their crowns and the rate of their growth, they have a patchy appearance, and from a distance present a jagged skyline. On the other hand, if we plant *pure* avenues

with one species only for a number of miles, they will look harmonious and pleasing, and the skyline will be regular and wave-like. *It is*, therefore, *very essential that mixtures of different species are avoided and pure avenues of a single species planted over long stretches of road.* This will not only improve their appearance but will also render management more economical, replantation easier, and will rationalize their exploitation for commercial purposes. If *mahuas* and *neems* are grown in pure avenues for miles, an oil-crushing industry can easily be started in such districts. Growing such trees in compact areas will effect a saving in transport. Similarly, the furniture-making industry can be encouraged in the sub-Himalayan districts which may specialize in *shisham*, *sal* and teak. The tamarind fruit which now only serves as a staple diet for monkeys can be profitably exported to the Punjab and West Pakistan. *Mahua flowers* can be used in the manufacture of power alcohol.

The main function of a roadside avenue is to provide shade. Therefore, those trees should be planted which are quick-growing and which at the same time provide dense shade. Trees with an umbrella or sub-umbrella crown like *neem*, *mahua*, *imli* and mango are more suitable than trees with a linear elongated crown like teak, eucalyptus and millingtonia. Those trees which provide shade and also yield valuable timber or fruit should be considered the more desirable. The trees should be planted 40 feet apart, so that their crowns may develop freely. Where the road is more than 100 feet wide, a double avenue of trees with the outer avenue near the boundary line should be grown. For instance, a part of the Lucknow-Rae Bareli road has such a double avenue and it is shady and cool.

Trees for roads should be selected with due regard to rainfall, soil, temperature and water level. *Only those trees should be grown along roads which provide thick shade and are also valuable from the economic point of view.* The following trees which are shady and also yield products of economic value are recommended:

Neem (*Melia azedarach*)—The leaves and bark are used for medicinal purposes and the seeds yield valuable oil. It can grow on an alkaline *usar* soil.

Mahua (Bassia latifolia)—The fruit is edible and the seeds yield

oil. It is also ornamental and its coppery leaves appear beautiful in March and April. Suitable for clayey soils, it can also stand semi-alkaline soils.

Imli (*Tamarindus indica*)—A beautiful tree which stands the dust of roads very well; its fruit and timber are also valuable. Suitable for dry areas.

Shisham (*Dalbergia sissoo*)—Yields excellent timber. Suitable for sub-Himalayan districts with a rainfall of over 40 inches.

Mango (*Mangifera indica*)—Yields valuable fruit and dense shade. Suitable for clayey or mixed soils with the water level at 30 feet or less.

Albizzia procera (*sufed siris*)—A quick-growing beautiful tree. Grows easily on a sandy soil. On account of the light yellow colour of the trunk, it reflects even weak light. An excellent roadside tree.

Pithecolobium saman (rain tree)—Suitable for moist districts with a rainfall of over 40 inches.

TREES UNSUITABLE FOR ROADSIDE AVENUES

On no account should the following trees be planted along the roadside:

Brittle Trees

Eucalyptus. All species
Millingtonia hortensis
Eugenia jambolana
Albizzia lebbek
Cassia siamea
Ficus glomerata

All these trees have very weak wood, and consequently break easily in a wind-storm. The result is that after a heavy storm roads become blocked and traffic is stopped for a considerable length of time. During a storm these trees are a positive menace to the lives of unfortunate travellers who happen to be on the road. Besides,

eucalyptus and *neem-chambeli* have linear elongated crowns which provide poor shade.

Thorny Trees

Acacia arabica
Acacia modesta
Zizyphus jujuba

These are thorny trees and their thorns are a nuisance for the pneumatic tyres of small cars, cycles and motor-cycles.

CHAPTER VI

PLANNING YOUR HOME GARDEN

GARDENING, LIKE MUSIC, is a most sensitive fine art. A landscape designer should be an artist, an aesthete, a botanist, a gardener and an architect. As an artist, he should have an eye for colour and form; as an aesthete, love for nature and beautiful plants. He should also know the anatomy, physiology and ecology of plants, as well as the principles of painting, sculpture and architecture to appreciate the relationship between plant form and building. He should not only be able to select plants which are suitable for the soil but also possess a highly trained aesthetic sense so that he is able to appreciate the principles of balance, rhythm and accent in the planting of trees.

Beauty and utility should be harmoniously blended. Beauty and utility were opposite poles a century ago when expensiveness and ornamentation were the chief canons of beauty and it was thought necessary that a chair or a table must be expensively carved to be beautiful. Now we appreciate that a piece of furniture or crockery can be simple in design and yet look beautiful. The ideals of utility and beauty have now coincided. We realize that whatever is to be designed must perform its function easily, thoroughly and gracefully. In fact, all true beauty is functional. The body of a well-developed woman is beautiful, because it expresses its function of procreation and maintenance of the species so well. A tea-pot is beautiful when it can hold a sufficient amount of hot water and pour it out in a steady stream. Similarly, a garden will never look beautiful where trees of all varieties are jumbled together without due regard to the colour of flowers, the shape of crowns and the height of plants. A garden is a place for repose and quiet contemplation of beauty, and if its design is such that one experiences a sense of irritation, it is a bad design.

In a garden design one has to see that a tree is placed properly and that the right tree selected. One has to select one's tree, and also a

good site for it. If a dwarf *kachnar* is placed behind a tall colvillea, it is a bad design. The place of the object is thus as important as the object itself.

Roote and Kelly have defined landscape design as the 'satisfactory and consequently beautiful composition of natural areas—shape of earth, trees and sky—in three dimensions'. The tree form shows a remarkable adaptation to topography. We usually find that the shapes of the crowns of trees which grow in a particular locality are adapted to the landscape. Thus the twisted cryptomerias of Japan grow on irregular volcanic rocks, the elongated conifers like the pine, deodar, cypress and fir with columnar stems and elongated globose crowns harmonize with the pyramidal mountains of the Himalayas, and the semi-globose oaks, chestnuts, maples and apples go so well with the rolling downs and small hillocks of England and France. On the other hand, umbrella-like acacias and *gul mohurs* and semi-umbrella-like *neems*, *mahuas*, mangoes, banyans and *peepals* of the alluvial plains of North India are admirably suited to the flat nature of the country. Contrast these with the grotesquely twisted trees of the Vindhyas which grow on inhospitable rocks. The modification of the tree shape and crown is possibly related to light. We often see columnar pine-like *peepal* trees in congested gardens. A tree with an umbrella or a semi-umbrella-like crown assumes its natural shape when plenty of space is available for the spreading of its branches. The linear habit of the conifers is extremely well adapted to crowding on a hillside. Possibly, it originated as a mutation and the resemblance of pyramidal or linear crowns of the conifers to pyramidal mountains is fortuitous. That this peculiar habit is chromosomal in origin is proved by the fact that these trees retain their linear shape even in the plains where there is no crowding in growth and no struggle for light is imposed.

It has been found that a tree from one particular habitat when grown in a different habitat serves as an accent material. Thus a cypress, a pine, a deodar, or a Lombardy poplar when grown in the plains serves as a most striking accent.

Accent : According to Roote and Kelley, "accent is attained by the use of a plant the distinguishing characteristics of which are quite noticeably different from those of the plants which form its setting." Thus, accent may be secured by planting trees and shrubs of a

different scale and form from those trees which are growing in the locality. A solitary date-palm, a polyalthia, a poplar, a millingtonia, a pine, a cypress, a deodar, or an araucaria growing in the corner of a lawn serves as an accent material when the other trees and shrubs are low and rounded. Accent may also be produced by using trees with unusual foliage or brilliantly coloured flowers. Thus a solitary colvillea or *gul mohur* serves as an accent material. Accent material should be used sparingly; a mass of tall and unusual trees all clamouring for attention produces confusion and loss of unity.

If a person is asked what type of planting scheme he would prefer for his house—formal or informal—it will be found that if he is progressive-minded, he will invariably go in for an informal design. It is here that a word of caution is necessary. The words 'formal' and 'informal' when used in relation to planting should be taken out of their social context.

Informal planting is suitable for a flat as well as uneven ground and formal planting for flat ground only. As Roote and Kelly have observed, "Informal design may be called a study of space relations, and formal design a study of lines. Informal planting consists of irregular forms irregularly placed, and formal planting consists always of regular forms regularly placed. In a formal scheme, straight lines and angles are emphasized on account of their greater precision, while the informal type lays larger emphasis upon curves and rounded masses. In the formal type little is left to the imagination, few unexpected arrangements occur, and the whole scheme is visible from one point, instead of unfolding gradually to the view."

Formal planting is based on geometrical balance, and informal planting on occult or unsymmetrical balance. A formal arrangement is usually based on bilateral symmetry and the use of trees with regular and symmetrical crowns. The Moghul gardens with their rows of cypresses are typical examples of formal planting. Formal planting is always used in connection with architecture. It is the architectural element which predominates, and the trees used repeat the character of the lines of the building. There is a marked resemblance of the cypress trees grown around the Taj Mahal to the four linear towers. Formal planting is particularly suitable for buildings in cities. In cities, lines are straight or rectangular and their primness and unnaturalness

must be repeated in the garden of the house by a symmetrical arrangement of the trees and shrubs, and the use of trees and shrubs with a regular shape. In some cases, where the crowns of trees and shrubs are not naturally regular, the desired result can be achieved by clipping and pruning. In the formal type of design, the walks, hedges, walls or bedding are considered as line-divisions. The line being the dominant factor in the disposition of the area, more attention is paid to the arrangement of the material than to its character.

Informal planting is suitable for houses in our Himalayan belt and also in some parts of the Deccan Plateau. In this type of planting, the balance is symmetrical and is a matter of gradual appreciation. In fact, an informal type of planting combines a number of independent balances which form a unity. Its beauties and subtleties are gradually unfolded and not thrust all of a sudden before the gaze of the onlooker. The Japanese garden is a typical instance of informal planting. The horticultural element preponderates in this type of planting. Free use is made of shrubs which are placed at unequal distances individually or in groups. Trees are selected for their individual value—the beauty of the colour of flowers, their fragrance or the charm of their foliage or the twisted shape of their branches.

If planting of ornamental trees in the compounds of private houses is properly planned, their cumulative effect will be very striking and thus any individual can create an artistic environment for his family and also add to the beauty of the town which has a claim on him as a citizen. Unfortunately, ornamental trees find a very unimportant place in our house-building schemes. Few people realize that ugly knotted *neem* trees, dark mango and *siris* trees with noisy rattling pods produce a very ugly effect and mar the beauty of even the most modern-looking building. Compounds of houses with a crowded growth of mangoes, guavas and jack-fruits look gloomy, dark, depressing and dismal.

The best plan for a house of an average size is as follows: ornamental flowering trees of medium size should be planted at the sides, dwarf ornamental trees or shrubs in front and fruit trees at the back of the house where they are not visible from the main entrance.

In the case of small and medium-sized houses with a small

compound, ornamental trees should be planted *only on the outer boundaries*. It is no use planting avenues on the inner roads in a small compound, for such avenues produce a stifling effect and the compound appears narrower still. If one has about two acres of land, then one should have a double row of trees at the sides; the outer row should be of evergreen shade trees with ornamental foliage like *Acacia auriculiformis*, *Polyalthia longifolia*, *Putranjiva roxburghii* or *Phyllanthus emblica*. There should be a row of one species on one side and of another on the other. The first three of these have a compact linear crown and beautiful foliage. When planted at a distance of 15 feet, they produce a beautiful screen which also serves as a background for the flowers of ornamental flowering trees which should be put in the second inner row at a distance of about eight feet from the outer row. Only dwarf flowering trees which are listed separately should be grown, for it is no use putting big trees with spreading umbrella-like crowns like the *gul mohurs* in the compound of a small house where adequate space is not available for their full growth.

There are also a number of trees and shrubs which emit fragrance at night, especially during rains, such as *Gardenia lucida*, *G. florida*, *G. latifolia* and *Cestrum nocturnum*. These can be planted to their best advantage opposite windows and doors of bedrooms, so that one may enjoy their fragrance in the evenings, particularly in the summer months.

While planning one's ideal home, one must not forget to pay proportionate attention to the layout of one's compound. The house and the garden should be designed as a unit, and one should consider how the garden will look from the house and how the house will appear from the garden. The garden provides a background and setting to the house, as a frame to a picture. The view of the garden from the house is very important and there should be something pleasant and colourful to look at from every door, window and verandah. Facing the verandah beyond the open lawn, one may plant pink cassia, *amaltas*, peltophorum, jacarandas or bauhinias which all flower from March to June, the hot months in which we sit in the

verandahs of our houses. However, the house should not be smothered with trees. The trees should be restricted to the boundary wall and corners of the plot, and there should be a level, quiet and restful lawn in front of the house. In a small plot of land, a feeling of spaciousness is given by a fore ground of lawn, and if trees are planted too near the house, the result is a stifling confusion and a narrowing of the compound.

As regards a design for the garden, sound advice for a person building a modern house is to choose a simple design harmonizing with the plain architecture of the house. Intricate flower-beds with borders, unnecessary hedges, meaningless paths, useless pergolas, sun-dials, fountains, statues and unnecessary green-houses should be avoided. Star-shaped and polygonal flower-beds are difficult and more costly to maintain and appear irritating, as compared with simple rectangular, round or oval plots which are not only easier to maintain, but are also restful. If there is an uneven piece of land, it should be made use of by making terraces for the growth of annuals. Annuals grown on four to five terraced plots present a fine display. The flower-beds should be at least six to ten feet broad, for the annual herbaceous border with tall annuals at the back, medium-sized plants in the middle and dwarf annuals in front cannot be displayed to its best effect in narrow strips of land.

So far as verandahs are concerned, it is better to keep them free from crotons, ferns and such other plants. Too many flower-pots in verandahs, a relic of early Anglo-Indian gardening, create untidiness and are also favourite haunts of snakes, scorpions and spiders. Fern-houses also go ill with modern houses. On the other hand, cacti with their peculiar globular, cylindrical and snake-like shapes fit in admirably well with modern architecture, and a rock garden with an assorted collection of cacti is an asset to a modern house. Lantanas, *hazara* orange, petraea and bougainvillaeas grown in standards also add a good deal of charm to a compound. But one should not have too many of these plants. A few plants judiciously placed at appropriate places produce a far more pleasing effect than a jumble of plants. Simplicity of treatment and design is the keynote of modern gardens.

Hedges form an important component of the garden in the compound of a house. Here, too, one must discard formalism. Place a hedge where it is necessary and where it can serve some purpose. Hedges can be used for separating the kitchen-garden from the flowering garden of annuals, or for securing a portion of the garden where one can recline in comfort in the sun during winter. A variety of cypress called *mor pankhi* forms an excellent hedge, and on account of its evergreen nature and dark green colour is to be preferred to common dodoneas and durantas. Hedges are used for marking the boundaries of the compound and for screening servants' quarters, garages and other features of the house.

Where the land available is small, one should not have the building in the centre. This will result in the creation of ribbons of land on the sides, which cannot be of much use. The building should be placed on one side, thus leaving a fairly ample space for a lawn in front and on one side in the shape of an L, the sides of which can be planted with dwarf ornamental trees. In planting, one should also overcome the craving for symmetry, and not plant exactly similar trees on both sides. In the art of decoration, a balancing effect is more desirable than dead geometrical symmetry. Two groups of trees of two different sizes on the sides create an artistic balancing effect. In modern decoration, the tendency is to break the symmetry in such a way that a balance results.

There are some who would rather have plants which produce flowers all the year round than annuals which flower for only a couple of months. Where space is limited, there is much to be said in favour of this view. Canna beds, ornamental shrubs like *Myenia erecta*, red, yellow and orange varieties of ixora, blue plumbago and *Zinnia linearis*, a perennial dwarf zinnia with orange-coloured flowers, provide a good substitute for annual flowers. Canna beds can be laid out opposite bathrooms, as their broad leaves have a quick rate of transpiration and provide an easy solution for the drainage problem.

It is not intended, however, that fruit trees are to be totally banished from the compounds of private houses. From the aesthetic point of view, they should on no account be grown in the front part of the compound of the house because of their unattractive appearance.

They should be relegated to that part of the compound behind the house where they will not be visible from the entrance. The governing principle should be aesthetic planting in the foreground and economic planting in the backyard of the house. Economic planting should be unobtrusive enough to escape notice and should attract least attention, if at all.

Dwarf Ornamental Trees Suitable for Small Compounds

FLOWERING TREES

Acacia auriculiformis
Alangium lamarckii
Baubinia purpurea
B. variegata
Butea frondosa
Cassia fistula
C. javanica
C. marginata
Cochlospermum gossypium
Cordia sebestena
Crataeva religiosa
Erythrina blakei
E. cristagalli
Gliricidia maculata
Guaiacum officinale
Holarrhena antidysenterica
Jacaranda minosaefolia
Brownea coccinea
B. ariza
Kleinhovia hospita
Lagerstroemia thorelli
Mesua ferrea
Milletia auriculata
Plumeria rubra and *P. alba*
Pongamia glabra
Saraca indica
Solanum urightii
Spathodea nilotica
Sterculia colorata
Tecomella undulata
Thespesia populnea

FRAGRANT TREES AND SHRUBS

Alstonia scholaris
Anthocephalus indicus
Artabotrys odoratissimus
Gardenia florida
G. latifolia
Ixora parviflora
Lawsonia alba
Magnolia grandiflora
Michelia champaca
Murraya exotica

G. lucida — *Nyctanthes arbortristis*
Hiptage madablota — *Schinus molle*

TREES WITH ORNAMENTAL FOLIAGE

Averrhoa carambola — *Citharexylum subserratum*
Callistemon lanceolatus — *Polyalthia longifolia*

TREE WITH ORNAMENTAL FRUIT

Citrus microcarpee — *Hazara orange*

Another nuisance which results from the planting of mangoes and guavas is that of flying foxes and parrots. While flying foxes produce eerie noises at night time, parrots play havoc with the fruit during day time. On no account should a residential compound be permitted to degenerate into a fruit garden with the necessary accompaniment of contractors, *malis* and beating of kerosene tins and creation of other weird noises devised to scare away birds and animals.

Even for the back part of the house, one should be careful in the selection of fruit trees. Citrus plants like grapefruit, oranges, sweet lime and lemons are particularly desirable on account of the sweet smell of their flowers; their fruit is rich in vitamin C and is a welcome addition to the table. *Carissa carandas* has scented flowers, and its fruit is ornamental and is used for pickling. Other trees which may be planted are figs (*Black Ischia* and *Black Turkey*), dwarf-grafted mano varieties like *dussehri, safeda* and *banarasi langra*, papaya, *bael* and grafted *amla*. The papaya fruit contains pepsin, an enzyme which digests proteins and is very helpful for meat-eaters. The *amla* fruit contains a very high percentage of vitamin C. Figs are a laxative and are beneficial to dyspeptics.

Where a large area is available, say five acres or more, one can make use of all trees like eucalyptus, trees with spreading crowns like *gul mohurs* and pink cassia. In such compounds, one can also have avenues along the inner roads. For avenues, trees with long, linear and symmetrical crowns are suitable, for they appear graceful when

grown in a line, and also do not obscure the view of the house.

An avenue of *Polyalthia pendula* appears very attractive along an ascending road. There is a beautiful avenue of this pendulous variety of *ashokas* in 'Kamla Retreat' at Kanpur. Other trees suitable for avenues of approach roads are *Polyalthia longifolia*, *Acacia auriculiformis*, *Callistemon lanceolatus*, Eucalyptus, *Sterculia alata* and *Averrhoa carambola*.

Only trees with regular and shapely crowns, and preferably those with pyramidal, linear, or spire-like tapering ones, are suitable for planting in the form of avenues. Other requisites are a straight stem, preferably tall, and a rich evergreen foliage. In large compounds with long drives, avenues are desirable. However, the choice should be restricted to one species only, as the beauty of an avenue lies in the uniformity of the crowns of trees and their growth. There are some trees, like the Royal Palm (*Oreodoxa regia*), which appear attractive when grown in the form of avenues in public parks only. In compounds of houses, they appear unsuitable. They impose a mechanical regularity on an avenue which may appear attractive along a broad public road, but turn out to be irritating in the compound of a house.

Three to four rows of eucalyptus trees grown at the back of a large residence provide a grand background. Eucalyptus is a gregarious tree, looking attractive only when grown in a clump. A single row of eucalyptuses on the sides of a house looks ugly as well as awkward. If it is desired to have eucalyptus at the back, three to four alternating rows should be planted close together. Colvilleas, which also grow very tall, look very majestic when grown at the corners in the back row.

A large compound also provides scope for planting dwarf ornamental flowering trees in clumps and in alternating rows. Even if big trees are grown, overcrowding should be avoided and the temptation of planting too many trees should be resisted. One should rather confine one's choice to a few select trees rather than aim at the creation of a botanical garden.

The *Ashoka* can be effectively used for screening off the compound of a big house from a public road. An *Ashoka* avenue along the

compound wall of the Government House at Lucknow is an admirable example of this type, and a thick, close-growing *Asboka* row forms a tall hedge, not only ensuring privacy, but also acting as a filter for dust.

While the symmetrical placing of trees may not be desirable in a small compound, it is essential in a big compound with a building of a large size. Such a building should be placed in the centre of the plot. In front, one may have a circular or semi-circular lawn as the space permits, fringed by a road. In the centre of the lawn one may plant a solitary tree with a spreading crown like the *gul mohur* or pink *cassia*. If one's predilection is towards water plants, one may place a pool in the centre with red lotuses, and white and blue-purple lilies. Small larvicidal fish can also be reared in such pools to keep them clear of mosquitoes. Even if a pool for the culture of aquatic plants is not regarded as desirable, it is advantageous to have a small swimming-pool at the back of the house built sufficiently high with its waste water discharging into the lawn and the garden.

List of Ornamental Trees suitable for Large Compounds only

BEAUTIFUL FLOWERING TREES

Anthocephalus indicus
Bombax malabaricum
Cassia nodosa and C. grandis
Chorisia speciosa
Colvillea racemosa
Lagerstroemia flos-reginae
Millingtonia hortensis
Peltophorum ferrugineum
Poinciana regia
Sterculia colorata

FRAGRANT TREES

Dillenia indica
Mimusops elengi
Pterospermum acerifolium

TREES WITH ORNAMENTAL FOLIAGE

Eucalyptus (all species)
Phyllanthus emblica
Putranjiva roxburghii
Terminalia arjuna

SHADE TREES

Diospyros embryopteris
F. infectoria
Ficus retusa
Kigelia pinnata
Tamarindus indica

CHAPTER VII

PLANTING TREES IN VILLAGES

FOR AN IDEAL village plantation, we require trees which provide fuel and fruit as well as small timber for agricultural implements. So the species selected must be fast-growing, easily grown and good coppicers. The following species are recommended :

For Fuel and Timber : Babul can grow almost anywhere in dry, waterless tracts, eroded ravines and on marshy banks of *jheels*. It yields excellent fuel as well as fine timber for agricultural implements and wheels of bullock-carts, and its bark is used for tanning leather. *Shisham* yields excellent fuel and timber, and is a fast grower. It has been extensively used for covering sand-covered fields along the banks of *choes* in the Hoshiarpur district and is a good coppicer. *Bakain* is a very fast-growing tree and yields insect-proof timber for ploughs. *Mesquite* can easily grow in sandy and rocky soils. *Dhak* will grow on the worst soil and can even tolerate mild *usar*. It is a good coppicer. Bamboos can easily be planted near ponds. Bamboo has many uses in the farm. In the case of mulberry, only *desi toot* should be encouraged.

Desi Fruit Trees : Good varieties of *desi* mangoes with thin juice and good flavour, and stones of grafted varieties like *safeda*, *dussehri* and *langra* should be selected and grown. In areas with a rainfall of over 30 inches, *kathal* trees should be encouraged. *Mahua* is a popular tree in Oudh and is valued for its fruit as well as for its wood. It can grow on mild *usar*. The *jamun* variety with a large-sized fruit, known as *Ra-jamun*, should be encouraged. This is one of the few trees which stand water-logging and can be grown on areas liable to be flooded.

Tamarind yields edible fruit as well as excellent coal for producer-gas engines.

Fodder trees provide valuable cattle feed in the winter months when grasses are not available. As compared with grasses, some leaf fodders, particularly those of *kachnar* and *toot*, are exceptionally rich in essential nutrients such as crude fat and protein, lime and nitrogen-free extractives. The best leaf-fodder species are *kachnar*, *toot*, *neem* and *babul*. Fodder trees also deserve to be grown in village plantations.

In India, the subject of tree crops deserves more attention at the hands of the Forest Departments. Tree crops can be encouraged in Government forests as well as in private village forests. Wild fruit trees like *ber* (*Zizyphus jujuba*) and *toot* (*Morus alba*) can be propagated on wastelands and in forests on a large scale. *Ber* provides a delicious fruit of many varieties which is eaten both in the fresh and dried condition. It is also an excellent fodder tree and its leaves are fed to goats and buffaloes. It is an extremely hardy tree which can stand both drought and frost, and is ideal for barren districts with comparatively poor rainfall. *Ber* also provides a valuable food during famine.

CHAPTER VIII

PLANTING OF TREES AND THEIR CARE

In India, we have a typical woodland climate which is favourable to the growth of trees. In wet districts with a rainfall of over 40 inches per annum and in the comparatively drier districts where irrigation facilities in the form of canals are available, a sapling grows into a fairly big tree in about six years. Most ornamental flowering trees produce flowers after a growth of four to five years. There is advantage in planting saplings one to two years old rather than raising trees from seed, especially in bare places where shade is quickly desired and a gain of one or two years' growth is of great value. Saplings over two years old are undesirable, as they take a long time to recover, especially when they are pot-grown with cramped roots.

Sites for pits should be planned and located beforehand, preferably three to four months before planting. There is a tendency to plant too many trees, as from the size of saplings people often fail to realize their eventual growth and the space they will occupy when they mature. Dwarf trees should be grown 15 to 20 feet apart, and larger trees when planted in an avenue or a clump should be at least 30 feet apart. Pits, at least four feet deep and four feet in diameter, should be dug at the sites selected in March. The soil should be exposed to the sun during April and May, and in early June mixed thoroughly with old farmyard manure or compost in the ratio of 5 : 1. The pit should be filled up with the mixture to ground level. Fresh or raw manure is not desirable, as it is a standing invitation to white ants. Where the soil is unsuitable for the growth of plants as in alkaline and sandy areas, it should be discarded and good soil from some other locality should be used for filling the pits. When the soil in the pits has subsided after the first two or three showers or by irrigation, the pits are ready for receiving saplings.

The best time for planting trees is January and February and in the

monsoon months from July to September. Where irrigation facilities are available, winter is the best time for planting deciduous trees. During winter, they are in a dormant state and are hence less likely to suffer damage when dug up. For evergreen and semi-deciduous trees, the rainy season is the best time for planting. Where irrigation facilities are available, it is preferable to plant trees in the last week of February, as the trees, thus planted, will be benefited by the spring growth and will be securely established by the time the rains come. In places where irrigation facilities are not available or the water supply is inadequate, planting should be done towards the end of July. If trees are planted in February, the best time for planting is in the evenings. During monsoons, the planting should be done on a rainy or cloudy day.

When removing the plant from the pot, the ball of earth round the roots should not be removed or broken. The roots should be loosened and straightened. Injured portions of the roots and branches should be cut off. The rootcollar should be just under ground level and care should be taken to secure the same position for the sapling in the pit. It is injurious to plant too deep by burying the stem underground. A hole should be made in the pit sufficiently deep to receive the roots of the sapling. The plant should be placed in an erect position in the hole thus made, and the soil packed tight round the plant. After planting, it should be given a thorough drenching. These precautions are necessary for the successful growth of the saplings, and where these are not observed, the transplants mostly die or remain stunted.

The practice of planting more than one sapling in a single hole in the hope that at least one of them will strike root is wasteful and undesirable. Saplings of one or two years' growth get established in the pits in a few days. If there are any casualties they should be replaced without much delay.

Grass has a very harmful effect, particularly on young trees, and the deciduous species suffer more than the evergreens. Fruit trees are practically suffocated by the growth of grass and their fruits become small and hard. During the monsoon rains, the volume of carbon dioxide in soil under grass increases about fivefold, compared with the

soil air of cultivated land. Carbon dioxide dissolves in the water film, and the formation of humus, nitrification, and mycorrhizal relationship are all affected. As compared with fruit trees like guava, *litchi* and *loquat*, forest trees like *dhak*, tamarind and *jarul* are able to compete with grasses and weeds on account of the fact that their deep root system admits of growth during the dry season when the grass is dormant and the active roots of the surface system are resistant to poor soil aeration and can successfully compete with grass for oxygen and minerals. Nevertheless, for a healthy growth of the plants, a thorough weeding and hoeing are of much greater importance than irrigation. As soon as the soil is dry, pits should be dug up with a hoe. The aeration of the roots stimulates growth, and the removal of weeds, which rob the transplants of nutritive material, will naturally be beneficial. The entire diameter of the pits should be kept free from weeds. Wet soil should not be dug. It is more likely to prove harmful and the churning of pasty liquid mud does not serve any useful purpose.

Most of our trees have two growing periods, the spring months of March and April and again the monsoon months of July to September. Where irrigation facilities are available, it is desirable to plant trees in February after the end of the cold weather. Young plants should be watered continually from March onwards, and particularly in the dry months of April, May and June, there should be at least five to six waterings a month. Each watering should be copious, so that water may reach the roots. Instead of watering with a water-can, the trees should be irrigated by flow through a channel and the pits should be filled to the brim. Grindal recommends the vertical insertion of earthenware flower-pots in the pits and pouring of water in these. Where watering is done by hand, this is a good method and guards against superficial watering by gardeners. Light surface sprinkling, even if repeated every alternate day, is actually harmful to the trees, for such superficial waterings tend to keep the roots of the tree near about the soil surface, and stunts the growth. On the other hand, if the watering is more thorough, the roots burrow deep down, thus resulting in a healthy growth of the tree. In the period between the waterings, the soil in the pits should be thoroughly hoed. The

working of the soil not only provides oxygen for the respiration of the roots, but also conserves moisture.

Where irrigation facilities are not available or are inadequate, the trees should not be irrigated in March. Irrigation promotes the growth of new leaves and the rate of transpiration increases. If irrigation facilities are not available later on, the saplings are damaged by excessive transpiration. In such circumstances, it is best not to irrigate the plants, but to leave them to their own resources.

In the second year, if the plant develops two or more shoots, it is better to retain only one healthy shoot and to remove the subsidiary ones. Pruning should be done with a pruning knife or saw, and to prevent infection, the open wounds should be tarred. As the tree grows, the lower branches should be cut out and interlacing branches in the crown should be removed to keep the frame clear. Staking in the early stages is also necessary, as it helps the tree to develop a straight trunk. Straight and stout branches of trees or bamboo poles can be used as stakes. The sapling should be tied with plantain-fibre with the stake, and it is desirable to insert a small pad of old cloth between the plant and the stake. Strings or wire should on no account be used, as they injure the bark. Nails also should not be driven into the stem, as in some cases they even kill the tree and provide an open door for the attack of fungi. When the stakes have served their purpose, they should be removed.

The protection of young trees in the compound of a house is no great problem. But, in public parks and on the roadside it is a serious task. The main enemies of young trees are goats, cattle, monkeys and mischievous boys. The best solution is to provide tree-guards of bricks, lime or cement plaster at the top, so that the bricks are not stolen. Tree-guards of bricks are suitable for public parks, town roads and platforms of railway stations. Along the roads in the countryside, however, tree-guards of bricks are expensive and are a standing temptation to villagers and cartmen who remove them for making *chulahs* for cooking their meals. In such cases, a mud structure affords the cheapest and best protection. A ditch around a mud structure serves as a useful barrier against cows and buffaloes, but it is also necessary to place thorns on the mud-walls to ward off monkeys, boys and goats.

The pruning of some fruit trees is essential to keep their crown in good shape, especially in the compounds of houses where the space available for the expansion of their crowns is limited. However, pruning should not be indulged in for its own sake. Every tree has its natural crown which is usually symmetrical and the necessity of pruning ornamental trees very rarely arises. But pruning is a necessity in apples, pears, and other deciduous fruit trees. Many of the trees like *amaltas*, *neem* and *putranjiva* can stand quite drastic pruning, and in some cases large growing trees can be headed back at 15 to 20 feet. In the case of quick-growing trees like *jacarandas* and *gul mohurs* it is more desirable to remove the tree altogether after 20 years and to plant afresh. Dead or diseased branches should always be sawn off.

The training of trees is also essential from the age of two to three years. By properly bending and tying young trees, beautiful structures result. Glorietas and gateways of *amaltas* can be made and bottle-brush trees can be bent over tanks like weeping willows. Even trees with crooked branches like *Cassia nodosa* can be compelled to form a straight stem in a house with a limited space, if at the commencement the branches are thinned out and the main stem is staked.

The development of an adequate number of nurseries is an essential preliminary step in the planning of the growing of ornamental, fruit and shade trees. At present the number of nurseries is very inadequate, and a big programme of expansion with more staff should be undertaken and definite quotas should be fixed for each nursery, so that sloth and indifference on the part of individuals may not stand in the way. There are nurseries at Delhi, Chandigarh, Saharanpur, Bangalore, Hyderabad, and Poona connected with the Government gardens which can supply saplings of ornamental trees. Considering the huge number required to meet the national need, these nurseries are too small. At present very few people have knowledge of the wealth of ornamental trees which we possess in this country, and we see the pitiable spectacle of *jamuns*, *mahua* and *chilbil* plantations in the compounds of houses in bungalows maintained by the Public Works Department and other public places.

Demand will be created by properly organized propaganda, and by diffusing knowledge about the selected ornamental trees in schools and colleges. When the average man is in need of a tree for planting, usually he gets hold of the nearest available one, irrespective of the fact whether it is *neem* or *gul mohur*. If he is advised as to what he should plant and at the same time is provided with the plants at a moderate price, he will certainly show discrimination.

There is need for expansion of nurseries in our State capitals. At the same time, nurseries should also be developed at the headquarter towns of all districts in gardens owned by the Municipal and District Boards, and the compounds of bungalows belonging to the Public Works and Canal Departments. The nurseries of District Board and Municipal Board gardens should specialize in ornamental and fruit trees, and those of the Public Works Department and canal bungalows in ornamental, shade and fruit trees—ornamental trees for the compounds of bungalows, shade trees for roadside avenues, and fruit trees for canal roads.

M.D. Chaturvedi has given many helpful hints about raising nurseries in his pamphlet *Roadside Avenues*. It is necessary that the inspecting officers should also know how to raise a successful nursery, so that this important work is not left to the whims of gardeners. We cannot do better than reproduce Chaturvedi's very helpful instructions on the planting of avenue trees from his pamphlet :

Site for Nursery : Nurseries should be raised on the best available soil. Well-drained deep sandy loams are best suited for plant growth. Heavy clays should be avoided as far as possible. Posts for the erection of shades to protect young seedlings from frost and a desiccating sun should be permanently fixed around nursery beds.

Manuring : Thorough soil-working and an occasional dose of organic manure like cowdung and vegetable litter will result in good sturdy plants capable of standing transplanting shock with a minimum of wastage. Nursery beds should be about five feet wide permitting the gardener to reach the middle from either side, or of any convenient length. A convenient size is 5 feet by 25 feet to hold 500 plants, six inches apart. The long side of beds should run

east-west for convenience of shading, if necessary.

Sowing of Seeds : Seeds should be sown six inches apart and just covered with fine soil. Hard-coated seeds should be softened by placing them in boiling water for a few minutes, and then allowing the water to cool. Nurseries should be dead level, otherwise seeds sown will tend to wash out on the lower end. Beds are to be carefully irrigated in the mornings in preference to evenings, because photo-synthetic activity is at its highest at noon. The soil should be lightly worked after each irrigation.

Weeding : Nursery beds should be kept scrupulously clean of weeds, and the soil well worked up. Good weeding and soil aeration are as important as irrigation. The tendency to stress the importance of irrigation at the expense of weeding and soil-working results in more weeds than plants.

Season : It is both convenient and cheaper to sow seeds in nursery beds at the break of the monsoon.

Transplanting : The seedlings may be retained in the original seed-beds till the following February when they should be dug out with a ball of earth and planted two feet apart in another bed. These transplants should be irrigated right through the summer. At the break of the following monsoon, they should be shifted again and put out three feet apart. Seedlings picked out twice under nursery conditions get accustomed to transplanting shock, and their root system is prevented from getting unwieldy. At the break of the third monsoon when the plants are two years old, they are ready to be planted on the roadside.

Transplants should be carefully dug out and, as far as possible, any injury to the root system avoided. An irrigation or two just before picking out makes the soil soft and easy to work. Injured roots are best cut clean with a sharp knife. The ball of earth around each plant can be kept in place by a piece of gunny bag or straw tied round by a piece of string, and stitched where the lead is long. The gunny bag is to be kept moist during transit.

It is advisable to cut down transpiration during the transplant-ing period by reducing the leaf surface. With the exception of the leaves on the leading shoots, all leaves may be nipped off with a

sharp pair of scissors, but not plucked anyhow.

Plants put out at the break of the rains take a fortnight to three weeks to get established. A delay of two to three weeks may make all the difference between success and failure. Most plants stop growth by the end of October and irrigation, where possible, must begin at the beginning of the following March to take full advantage of the growth in spring.

Protection Against Frost : The rigours of an excessively cold whether are very much reduced by a protective cover, irrigation and loosening of soil. Big and sturdy transplants usually manage to send in roots deep enough during the very first monsoon to tide them over the following summer, rendering irrigation unnecessary where not available.

CHAPTER IX

THE FESTIVAL OF TREES

IT IS NOT the lack of aesthetic sense and respect for trees on the part of the people alone that has led to the thinning of our forests and the degradation of our woodlands. A growing population gave rise to land hunger, and man, his plough, his cow and his goat invariably had their incursions upon the natural tree wealth. Even marginal lands and community wood and grazing plots were not spared, even if it was only for clearing such lands of the trees, taking up an unprofitable agriculture on them for a short time and abandoning them soon to their fate. An undecided and halting national forest policy aided the degeneration of national and State forests further, and the inevitable happened.

Soil erosion, for decades confined to patches here and there, assumed dangerous proportions. With the denudation of village forests, villagers were soon in search of alternative sources of fuel for their homes, and began using cowdung at the cost of impoverishing the soils and consequently lowering their yields. This led to further incursions into the tree reserves. Nature's balance had been disturbed, and a costly lesson was being learnt.

What was required was a national awakening to the necessity of planting trees, and attempts at tree rehabilitation on a national scale. The beginning came in July 1947, when a very successful Tree-Planting Week was celebrated in Delhi State. This was the first tree-planting festival of India in which national leaders like Jawaharlal Nehru, Rajendra Prasad and Abul Kalam Azad participated along with many others.

The main objective of celebrating the Tree-Planting Week was to focus the attention of the people on the national importance of planting trees and to make them tree-conscious. This objective was

fulfilled to a great extent. There was a scramble for seedlings at the nurseries, and in many States, the Week was celebrated on an organized basis.

The Festival is not confined to cities and towns alone; it has seeped into the villages, bringing home to the villagers the idea that trees mean better crops, better living conditions, better cattle and more beautiful villages.

The *Vana Mahotsava*, as K. M. Munshi renamed it, has achieved a great deal. But still more efforts are needed in order to consolidate further progress. People should definitely know the importance of tree-planting in our lives and the observance of the festival should not become a mere ritual.

The *Vana Mahotsava* is not a festival, as other religious festivals are, lasting for a day or two and thereafter developing into a rite devoid of meaning or importance. It is a symbol of an unending movement towards verdure. The planting of a tree is merely the starting-point of a tacit understanding to do all that is necessary to provide it with appropriate living conditions and protect it against damage or destruction by man or beast.

No doubt, many appreciate the true significance of the Tree Planting Festival, but effective methods should be adopted for disseminating information on this festival to the general public. They must be reminded of the sacred past when forests clothed the land and cradled the Aryan civilization. They must also be told of how the law of diminishing returns is operating in the field. It is mainly the ill-planted and ill-balanced rural economy that has allowed cultivation even of grazing land and tree land. The value of the forest trees in the national economy has to be realized. The trees control erosion and mitigate floods, provide shade and shelter against the tropical sun and desiccating winds. They also serve to make the village beautiful.

Again, the occasion of ceremony should be given a practical turn. Large-scale nurseries should spring up to provide a variety of planting material and these should be available in sufficient quantity in order to meet a large demand. All available resources should be directed towards this end, and all those who want to plant trees should easily and with very little cost get what they need to plant.

People should be properly guided in the technique of planting and aftercare of trees, including adequate protection against adverse elements. The guidance will have to be sustained, especially in the initial stage.

The active participation of children in tree-planting festivities will help build up a future generation of tree-lovers. For this reason, a special course on the planting of trees should be instituted in the curriculum in all schools. Teachers and students should plant trees with their own hands, thus instilling in all minds the dignity of labour. Spades and hoes and, where necessary, irrigation appliances should be provided to all schools. Special prizes should be awarded for good work.

In villages, rural communities should be persuaded to plant not only occasional individual trees but also compact blocks of them wherever land is available. Our villages need windbeaks and shelterbelts. Such work deserves to be initiated during the *Vana Mahotsava*.

The plan of tree-planting should be flexible enough in order to accommodate the needs of the community. The plan need not be confined to the planting of flowering trees alone, though this should form an integral part of it. The planting of timber trees like tamarind, *neem*, *bakain*, *shisham*, casuarina and *babul* on wastelands, *amlas*, *kathal*, mangoes and bananas in gardens and home compounds and backyards should also form a part of the programme.

The Tree-Planting Festival is now being celebrated on a progressively bigger scale each year. If public enthusiasm in this direction is kept up properly, it will not take long when every nook and corner of our country will brighten up with the clear strong gold and scarlet, the rich purple and blue and the waxen white of numerous flowering trees. The younger generation will realize the truth of the message of a minor nineteenth-century poet :

> "He that planteth a tree is the servant of God
> He provideth a kindness for many generations
> And faces that he hath not seen shall bless him."

The festival of trees is at present being celebrated in different

countries under diverse names. The name is immaterial, so long as its aims are the same. Now the time has come when such festivals are an international event in which the tree as a symbol of enduring peace is the central theme of the celebration. It is befitting that the younger generation in every country learns to develop an international feeling of friendship and world peace. The exchange of indigenous tree seeds between the school children of one country and another, the establishment of forests or 'groves of nations' would not only be of high educational value, but would be of some considerable community interest and an effective means of promoting goodwill among nations. Many nations have adopted trees, shrubs and flowers as national emblems. The supply of seeds of such plants to schools in other countries would be a symbolic gesture of friendship and co-operation. Sponsoring such programmes as the International Friendship Groves, suggesting friendship and co-operation among nations in planting trees for public purposes, will have a definite impact on the adult mind. After all, forest problems are not confined to the boundaries of one country but are spread over a large region consisting of a number of countries. The international nature of the Festival will provide a common platform for the exchange of forestry knowledge, thus bringing about a better understanding between one nation and another.

CHAPTER X

TREES AND THEIR HABITAT

STRICTLY SPEAKING, ALL trees which are not cone-bearing are flowering trees. In some trees, the flowers are brightly coloured, as in *gul mohur* and Spathodea, and in others they are small, inconspicuous and green, as in *ashoka*. Trees which have showy flowers deserve to be classified as "ornamental flowering trees" in order to distinguish them from trees with inconspicuous flowers which are otherwise desirable on account of their beautiful foliage and have been classified as "ornamental foliage trees". Whereas most of the ornamental flowering trees are deciduous and a few are evergreen, nearly all the ornamental foliage trees are evergreen. Some of the ornamental foliage trees are particularly suitable for planting as shade-trees along roads and in parks on account of their thick spreading crowns.

A scrutiny of the list of ornamental flowering trees shows that only a few are indigenous, and the majority are exotics, introduced from foreign countries like Madagascar, South Africa, Tropical and South America, Java, Malaya and Burma. Whereas some of these trees like *gul mohur* and *gul-i-chin* have become fairly popular, there are a number of others which are still unknown to the layman, because no effort has been made to popularize them. Boys and girls in schools should be taught the names of these beautiful trees and parties of school girls and boys shuld be taken to public gardens to show them the trees when they are flowering.

Latin names of these trees may be preferred on account of their accuracy and international usage. But there is no harm in having popular names in simple Hindustani also. Most of our indigenous flowering trees have Indian names and these require only to be popularized. On the other hand, there are a number of foreign trees

which have no Hindustani names. The author has coined new names and these can easily be popularized in schools, universities and gardening institutions. Name plates with both Latin and Hindustani names should be fixed on selected specimen trees in all our public parks and gardens, so that the common man too may be able to identify them.

The flowering of trees is intimately connected with temperature, and it occurs later in the season as one moves from the South to the North, the delay in flowering being of the order of four days for every degree variation in latitude northwards. For example, mango flowers in Kerala about the first week of December; in Hyderabad about the first week of January; in Gujarat and Central India, about the first week of February; and in the Punjab about the first week of March. *Neem* flowers in the first week of January in Malabar; in the first week of February in Mysore; in the first week of March in central India; in the first week of April in the Punjab and northern India; and in the first week of May in the sub-Himalayan area. Similar variations are found in the flowering of tamarind and *babul*. Under an all-India phenological scheme, four trees—mango, *neem*, tamarind and *babul*—were selected for the study of the data of the flowering period. These trees grow in all the States, from Cape Comorin to the Himalayas, and can truly be called national trees, as they have an all-India spread.

Further, the variations in the time of flowering of the mango-tree from the extreme South (about latitude 80° N) to the extreme North (about latitude 30° N) is roughtly from the first week of December to the first week of March (90 days). In other words, the flowering of the mango tree appears to be delayed by nearly four days for every degree of latitudinal variation northwards. It is interesting to note that this is in agreement with the Bioclimatic Law formulated by Hopkins for North America. What is true of the flowering of these four trees is also true of most other flowering trees.

Bioaesthetic planting of ornamental trees has a close relationship with plant ecology, and its study is essential for the bioaesthetic planner. The texture of the soil, the availability of water resources, the amount of rainfall, the presence of rivers, canals and tanks, and the temperature play an important role in the growth of trees. Plants must

be placed in habitats which approximate to their natural surroundings. There are certain trees which flourish only in a moist climate with a rainfall of about 40 inches, or along the banks of rivers, canals and tanks. In such areas where the rainfall is less, these trees can grow with artificial irrigation, but they never acquire the same stature as they do in moist areas. This does not mean that such trees should not be grown in dry areas at all. If means of irrigation are available, they may be grown. A dwarfing in size takes place when trees which are the inhabitants of moist areas are grown in dry areas, and this is an advantage when considered from the point of view of the owner of a house with a small compound. *Lagerstroemia flos-reginae* (or *Jarul*) which is a big tree in Bengal is a medium-sized tree in the Punjab and Uttar Pradesh. Trees suitable for growing under various conditions are given below :

ORNAMENTAL FLOWERING TREES SUITED TO MOIST LOCALITIES

Name of Tree	Country of origin	Time of flowering	Colour of flowers
Amherstia nobilis	Burma	March	Salmon pink with golden spots
Bauhinia variegata	India	March-April	White, pink or mauve
B. purpurea	West India	Feb.-March	Red
Brownea coccinea	—do—	—do—	—do—
B. ariza	—do—	—do—	Pinkish red
Cassia marginata	Ceylon	May-June	Terracotta red
C. javanica	Java	—do—	Rose pink
C. nodosa	India & Malaya	—do—	Bright pink
Colvillea racemosa	Madagascar	October-Nov.	Scarlet orange
Guaicum officinale	West Indies	March-April	Blue
Lagerstroemia flos regina	India	April-May and July-September	Mauve purple
L. thorelli	India	—do—	White, mauve
Milletia auriculata	Burma	March	Purple mauve
Poinciana regia	Madagascar	April-June	Scarlet orange
Peltophorum ferrugineum	Malaya	October	Golden yellow
Pithecolobium saman	Brazil	March and September	Pale pink

Saraca indica	India	Feb.-March	Scarlet orange
Solanum wrightii	Brazil	All the year round; particularly in Oct.	White and purple blue

ORNAMENTAL FLOWERING TREES SUITED TO DRY LOCALITIES

Name of Tree	Country of origin	Time of flowering	Colour of flowers
Spathodea campanulata	Tropical Africa	February-March	Orange red
Sterculia calorata	India	April-May	—do—
Acacia auriculiformis	Australia	October-Nov.	Yellow
Burea frondosa	India	March	Vermilion
Cassia fistula	—do—	April-May	Yellow
Cordia subestena	—do—	All the year round; particularly January to March	Scarlet orange
Cochlospermum gossypium	—do—	March	Yellow
Erythrina indica	—do—	February-March	Scarlet red
E. blakei	—do—	April	Cinnamon red
Jacaranda mimosaefolia	Brazil	March-April	Violet blue
Melia azadirachta	India	April	Lilac
Plumeria alba	South America	March-April, July-October	White
Pongamia glabra	India	May	Mauve
Spathodea nilotica	Tropical Africa	February-March	Orange crimson
Tecomella undulata	India	March-April	Orange yellow
Thespesia populnea	India	All the year round; particularly in October and November	Yellow and reddish purple eye

DROUGHT-RESISTANT TREES SUITABLE FOR ARID REGIONS

Albizzia lebbek *Siris.* A deciduous, spreading, fast-growing tree,

40 to 60 feet high. Thrives in the Punjab, Rajasthan and South Iran. Moderately drought-resistant.

Butea frondosa — *Dhak* or *palas*. A medium-sized deciduous tree, in March gets covered with scarlet flowers. Extremely resistant to drought.

Cassia fistula — *Amaltas*. A medium-sized deciduous tree, 30 to 40 feet high. Gets covered with garden-yellow flowers in May.

Casuarina equisetifolia — Beef-wood tree. A tall evergeen tree; 50 to 60 feet high, with long needle-like leaves; native of Australia, grows well on dry sandy soil. Thrives in the Punjab and Rajasthan.

Eucalyptus citriodora — *Safeda*. A tall evergreen tree; thrives in the Punjab and Iraq.

Melia azedarach — Persian lilac, dake, *bakain*. Deciduous tree, 20 to 40 feet high; purple panicles in March; flourishes in the Punjab and Rajasthan.

Morus indica — Mulberry, *toot*. Thrives in the Punjab, Syria Iran and South Iran.

Phoenix dactylifera — Date-palm, *kabjoor*. Flourishes in West Pakistan, Iran and Iraq.

Prosopis juliflora — *Mesquite bean*. A deciduous tree, medium-sized, graceful feathery foliage; quick-growing, extremely drought-resistant, a native of Mexico.

Salvadora persica — *Pilu*, mustard tree of scriptures. A small evergreen tree with small oval fleshy leaves; extremely drought-resistant; flourishes in West Pakistan and Iran.

SALT-RESISTANT TREES

Azadirachta indica — *Neem*. Moderately salt-resistant.

Butea frondosa — *Dhak*, *palas*. Extremely salt-resistant; in fact, the only tree which grows successfully on saline, *usar* and *kalar* soils.

Bassia latifolia — *Mahua*. Moderately salt-resistant, can grow on slightly saline soil; yields good timber and edible fruit which can be fermented into liquor.

Eucalyptus citriodora — Moderately salt-resistant. Grows even in Iraq.

Phoenix dactylifera — Date-palm, *khajoor*. Flourishes in brackish soil.

Phyllanthus emblica — *Amla*. Flourishes in slightly saline soil.

Psidium guava	*Guava.* Can easily grow in mild *usar.*
Tamarix articulata	*Farash.* Thrives in arid saline soil.
Thespesia populnea	*Bhendi.* Thrives in the backwaters of Kerala.

TREES FOR SWAMPS AND MARSHY AREAS

Eucalyptus rostrata	Has a high rate of transpiration and is useful for draining marshy areas.
S. babylonica	Like the willow, highly suited to waterside planting.
Salix tetrasperma	Willow. Ideal for waterside planting.
Tamarix sp.	*Farash.* Can stand water-logging.
Plantains	*Kela.* Its broad leaves have a high rate of transpiration.

NECTAR-YIELDING TREES

Bauhinia purpurea

Bottle brush (*Callistemon lanceolatum*)

Horse-chestnut (*Aesculus indica*)

Faman (Eugenia jambolana)

Kachnar (*Bauhinia variegata*)

Neem (*Azadirachta indica*)

Shisham (*Dalbergia sissoo*)

Soapnut (*Spindu*)

Tun (*Cedrela tuna*)

Barna (*Crataeva religiosa*)

Sapium sebiferum also called *Stillingia sebiferum*

The majority of the trees listed above are suited to moist areas as they belong to tropical countries which have heavy rainfall and high humidity. On the other hand, among those shown suitable for dry areas are trees which can stand shortage of water. These are trees with special structural modifications which enable them to cope with dry conditions, heat and little water. Some of these are indigenous and thus are ideally suited to our dry tracts where irrigation facilities are poor and hot dry winds blow. They can tolerate arid conditions, but it does not mean that they grow only in dry and hot climates. They can also grow in moist areas and thrive.

However, on the banks of a canal, river or tank, such moisture-loving trees as *Lagerstroemia flos-reginae*, *Salix tetrasperma* (willow)

and *Sapium sebiferum* (*makhan*) should be planted. The last one which is also known as the Chinese Tallow tree, is a medium-sized deciduous tree whose leaves display lovely autumn tints and which is used for stream training in the Kangra district of Himachal Pradesh.

Very few trees can grow in marshy water-logged areas. *Eucalyptus rostrata* has proved a success in the water-logged areas near the Upper Jhelum canal in West Pakistan. Willows and tamarix are also suited to such areas. Where adequate protection against animals is available, the banana may also be planted. These trees can also be used for draining puddles which form near wells in our villages. These puddles should be enclosed with brick-walls to protect the young trees against cattle, and planted with the trees mentioned above. Where soakage pits have failed to drain away the water, these trees may succeed.

Soil plays a very important role in the life of trees. A high and well-drained soil of mixed sand and clay is ideal for the growth of trees. Water-logged, low-lying areas produce stunted growth. There are certain trees which can flourish in poor sandy soils. These are mostly members of the family *Leguminosae* whose roots harbour nitrifying bacteria in tubercles which fix atmospheric nitrogen and make it available to the tree. Then there are trees which can cope with alkaline soil, such as *Butea frondosa*, the common *dhak*. In fact, trees are a valuable index for distinguishing the type of soil in a particular area. Furthermore, there are trees which can grow in dry rocky areas with the minimum of soil, such as *Cochlospermum gossypium*, *Cassia fistula*, *Prosopis juliflora* and *Plumeria*. These trees are ideal for covering arid hills such as those found in central India and Rajasthan.

Animals, particularly goats, are the chief enemies of young trees. Some trees like *Cassia fistula* contain in their sap chemicals deterrent to animals. Goats, cows and buffaloes will not touch the leaves of *amaltas*, which have a purgative action on their digestive organs. Hence *amaltas* is well-suited for planting on wastelands which cannot be protected against grazing animals.

The Frost Line is an imaginary line, below which frost never occurs. It extends roughly from the sub-Himalayan districts of Uttar Pradesh to the eastern districts of the Punjab. The significance of this line lies

in the fact that the majority of the denizens of the equatorial and monsoon forests are unable to flourish in the areas above this line. Given sufficient protection in winter, they may grow in the area, but they will not be able to reproduce themselves in areas where frost occurs. This explains why *Colvillea racemosa* produces so few seeds even in Uttar Pradesh. Of the trees listed as suitable for moist localities, there are 12 trees which are natives of tropical countries such as Africa, Madagascar, Java, West Indies, Malaya and Burma. These trees cannot be satisfactorily grown in Kashmir and the Himalayan zone. In this matter, Uttar Pradesh, Bihar, Bengal, Madras and Maharashtra are more fortunate, in as much as the choice of trees available for planting is larger as compared with the northern area above the Frost Line. In these hill areas, only indigenous trees which are adapted to the climate are indicated.

1. THE MAST TREE OR ASHOK

(Fig. 1)

Polyalthia longifolia Benth. and Hook. f.

Family : ANNONACEAE

Other popular name : Asupala

Common Indian names:

Hindi—*ashoka (devdar)*

Bengali—*debdaru;*

Malayalam—*choruna;*

North India—*debdar;*

South India—*ashoke.*

The word *Polyalthia* is derived from two Greek words : *poly,* meaning much or many and *althia* from *altheo* meaning to cure, thus *polyalthia* means 'many cures' which is a reference to its medicinal properties. *Longifolia* in Latin means long leaves.

Distribution : A native of Ceylon and Bengal, found growing wild in the southernmost parts of India. A very common tree in eastern India.

Description : A tall evergreen tree with straight stem and slender branches which are more or less at right angles to the stem and which have a symmetrical pyramidal crown.

Beautiful lance-shaped glossy leaves narrowing to a long point, with wavy or undulating margins. They are light green, translucent when young, and occur in great profusion.

The flowers are star-shaped, yellowish-green in colour, inconspicuous, borne on long slender stalks, appearing from February to April.

The fruiting season is in July and the fruits are egg-shaped.

On account of its graceful column with downward sweeping

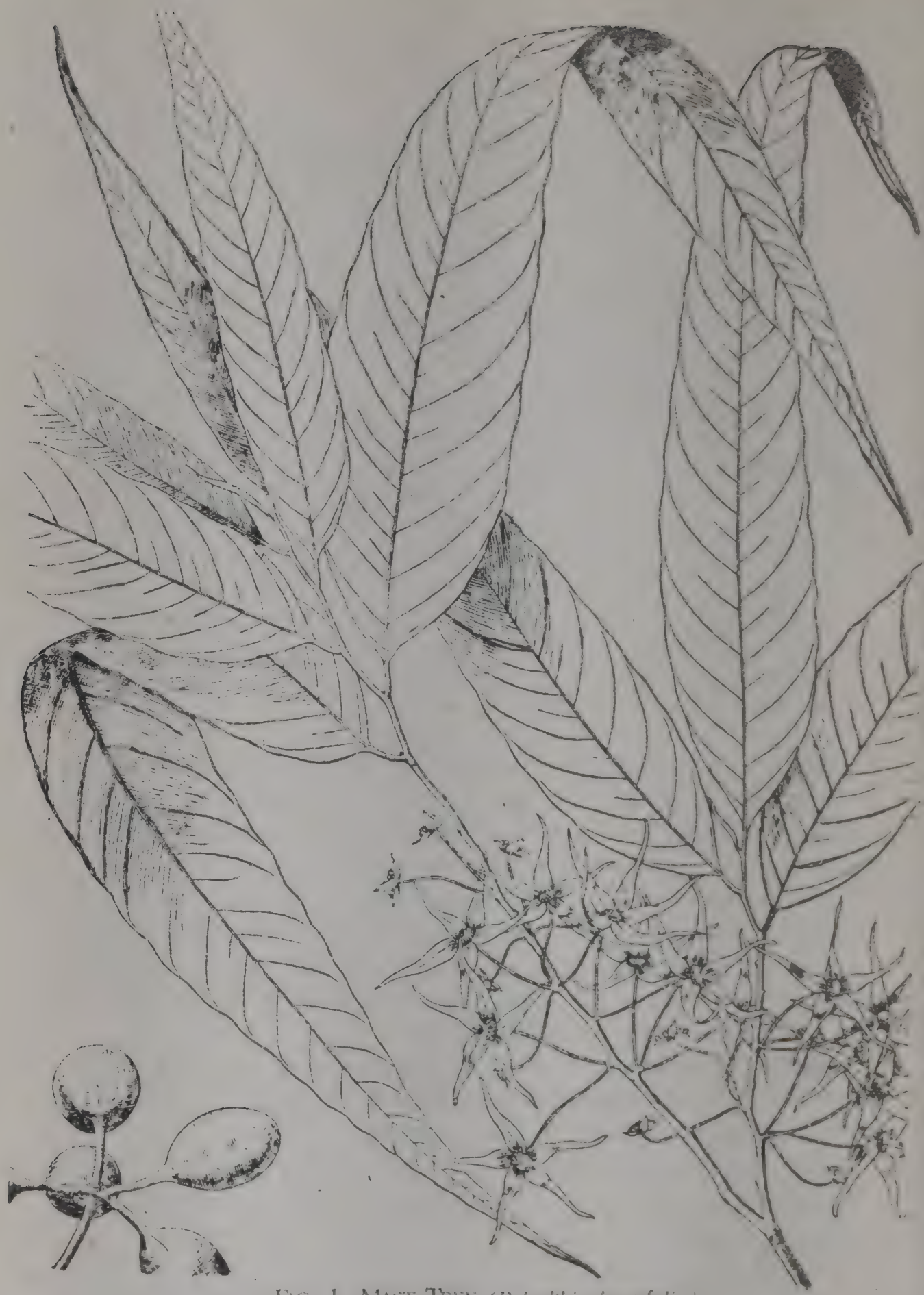


FIG 1. MAST TREE *(Polyalthia longifolia)*

branchlets and glossy foliage, it is highly esteemed as an avenue tree. The bark yields good fibre. The wood, light and flexible, is used for making drum cylinders, pencils and boxes. When ripe its fruit is eaten by bats at night and the seeds are scattered over the ground the next morning. Festoons of its leaves are used for decorating ceremonial gates and arches.

It is different from the real Asoka (*Saraca indica*) and should not be confused with it on account of its name.

Gardening notes : Propagated by seed, sown in July in flower pots and planted out when of suitable size.Transplants well.

When grown 15 feet apart on the southern side of the compound wall, the trees are a very good protection from the heat of the sun and dust and also act as a wind-break. An excellent tree for border planting in parks and homes.

2. THE WHITE FRANGIPANI

(*Fig. 2*)

Plumeria alba Linn.

Family : APOCYNACEAE

Other popular name : Pagoda tree

Common Indian names : Tamil—*peru, perumallari, perungalli;*
Telugu—*veyyivarahalu;*
Sanskrit—*kananakararira.*

Distribution : This tree is distributed all over the country. It is a native of Mexico.

Description : It is smaller than the temple-tree. It bears clusters of dark-green ovate leaves, hairy below.

The flowers have an exquisite fragrance and are white with no yellow in the centre. Blooms in March April and again from July to October.

It is the prettiest tree of the *Plumeria* genus and is almost evergreen. There are numerous hybrid plumerias designated by such names as 'tuberculata magnifica', 'lutea', etc. Some of these are available at the Royal Agri-Horticultural Society's Garden at Calcutta. I have seen a few of them in flower, and some are very fine, with flowers distinctly larger than the commonly grown varieties. There is an excellent avenue of this tree on the Madras beach.

Gardening notes: Easily propagated from cuttings. An excellent tree for planting in the compounds of houses.

FIG. 2. WHITE FRANGIPANI *(Plumeria alba)*

3. THE TEMPLE TREE

(*Fig. 3*)

Plumeria acutifolia Poir. (Syn. *P. rubra* Linn. Forma acutifolia Poiret)

Family : APOCYNACEAE

Other popular names : *Frangipani, Champa, Pagoda* tree
Common Indian names : Hindi—*chameli, gul-e-chin;*
Assamese—*galauchi;*
Bengali—*dalama phula;*
Kannada—*kadusampage;*
Gujarati—*dholo champo;*
Malayalam—*arali, vella champakam;*
Marathi—*khairchampa;*
Tamil—*ilattalari, perungali;*
Telugu—*arbataganneru;*
Oriya—*golochi.*

The *Plumeria* is named after a French botanist, Charles Plumier; *acutifolia* refers to the sharp-pointed or tapering leaves.

Distribution : A native of Mexico and Guatemala, it is grown extensively all over the country.

Description : It is a small deciduous tree with a crooked stem. The bark produces a milky juice when broken. A variety with white stem and branches which appear lime-washed is commonly found in Trivandrum.

The leaves are big, broadly lanceolate, tapering at both ends and quite distinctive due to prominent parallel veins. They are borne in crowded spirals at the ends of the long branches. The tree remains leafless from December until the rains. Young trees, however, remain leafy and attractive throughout the year.

FIG. 3. TEMPLE TREE *(Plumeria acutifolia)*

The flowers are waxy white with yellow centres, highly fragrant and borne in upright clusters. The petals are sometimes tinged with pink below. The flowering period is March-April, and again from July to October. The tree claims great affection because of its sweet-scented flowers which bloom practically throughout the year.

Fruits appear as two horn-like pods on a long pendent stalk and the seeds with a tassel of silk. The tree rarely fruits or seeds in India.

It is highly valued for ornamental planting and is often associated with temples. The bark relieves fever, heals sores, in plaster form reduces tumours and acts as a powerful purgative.

Gardening notes : Easily propagated from cuttings in July and August. The cuttings should be allowed to wilt before planting. It can thrive in sandy and stony soil with a rainfall of 25 inches or upwards. In India, the tree is venerated as the "Tree of Life" for, even if its roots are exposed roots, it will still go on growing and blooming, without showing any sign of wilting. If replanted in a new location, the tree again grows as if it had never been subjected to any harsh treatment.

4. THE INDIAN CORK TREE OR THE JASMINE TREE

(*Fig. 4*)

Millingtonia hortensis Linn. f.

Family : BIGNONIACEAE

Common Indian names :Hindi—*akas neem, minichambeli, neem chameli;*
Bengali—*akas nim, cork-gach, mini-chambeli;*
Kannada—*beratu;*
Malayalam—*katesam;*
Marathi—*akas nimb, kavla-nimb, mini-chambeli;*
Oriya—*bakeni, reali, mach-mach, sita-hara;*
Tamil—*karkku, mara-malli, kat-malli;*
Telugu—*kavuki.*

Millingtonia is named after T. Millington, an English botanist of the eighteenth century and *hortensis* is from a Latin word meaning pertaining to a garden.

Description : It is a fine tall and straight evergreen tree, reaching up to 60 feet, with a narrow crown and yellowish grey corky bark, having drooping branches and deep-green foliage.

The leaves are large and have many leaflets which are 1-3 inches long. The leaves are shed and new ones grow between January and March.

The flowers are silvery white, sweet-scented at night, and in terminal panicles in November and December and again from April to June. Soon after opening the flowers carpet the ground below.

The fruit is pod-like, slender flattened and pointed at both ends, splitting into two valves on ripening. Trees do not fruit easily in India.

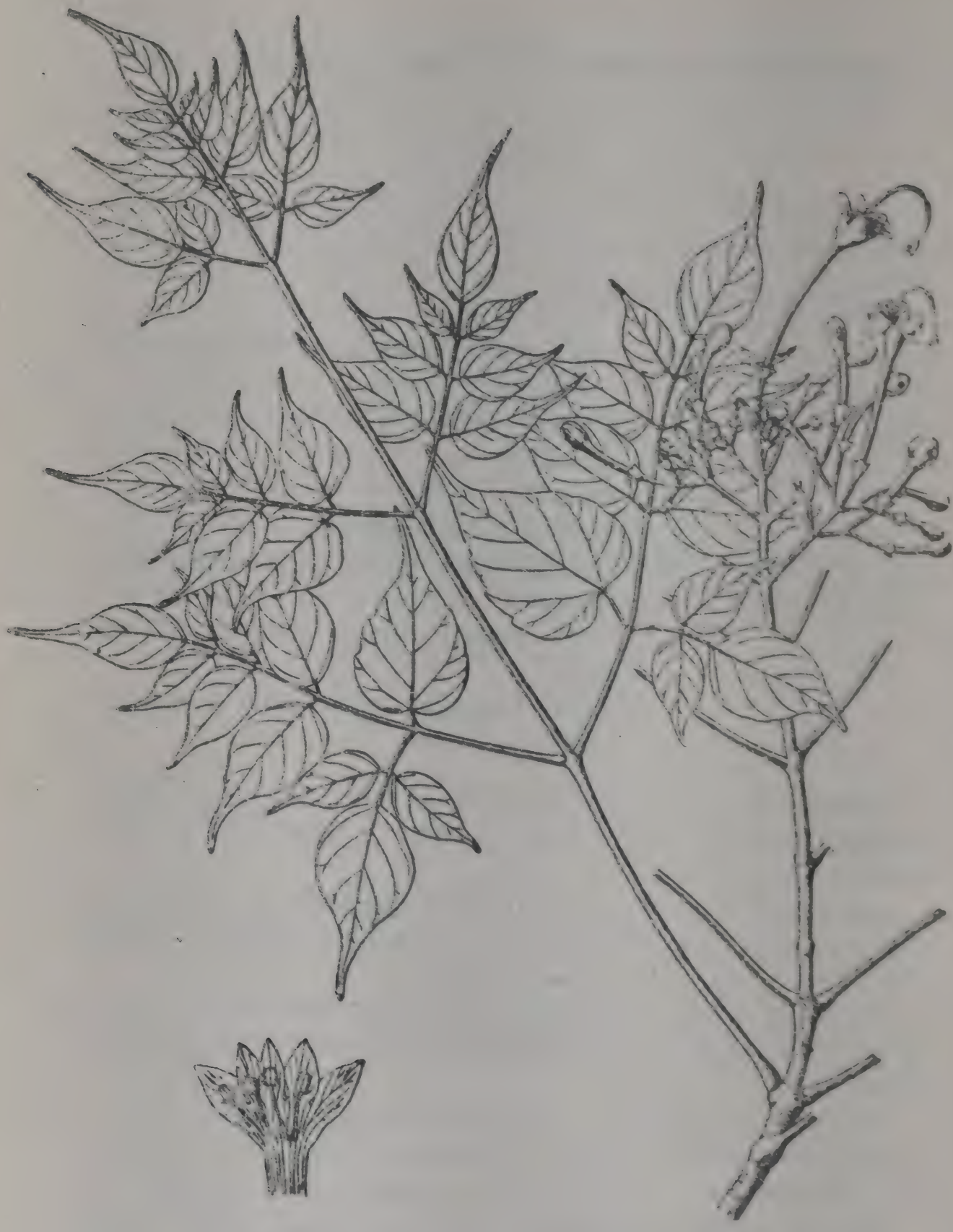


FIG. 4. JASMINE TREE (*Millingtonia hortensis*)

Seeds are thin and flat with a broad and delicate wing

The tree is cultivated throughout India for ornamental purposes The wood is useful for furniture and ornamental work The bark yields cork of inferior quality. It also contains a bitter substance and some tannin reported to be used in Indonesia as an antipyretic.

Gardening notes : Since the tree does not seed in most parts of India, it is mostly propagated by rootsuckers or by cuttings. It has a superficial root system and is generally surrounded by suckers which are dug up and replanted Where the tree seeds, it may easily be propagated by seed. The seedlings are transplanted a year later.

The wood being brittle suffers much from storms But its rapid growth recuperates the damage quickly. It is an attractive tree for avenue-planting in urban areas. An excellent avenue named after the tree can be seen in Lucknow.

It is a hardy, fast-growing tree, thriving best under moist situations, but also does well in dry climates.

5. THE MAUVE TABEBUIA

(*Fig. 5*)

Tabebuia speciosa

Family : BIGNONIACEAE

Tabebuia is derived from the Brazilian name of the tree.

Distribution : It is a native of Mexico, and is found suitable for moist localities.

Description : It is a small erect deciduous tree with leaves palmately five-leaved.

The flowers are large, funnel-shaped, arranged in groups on trees on a common peduncle and of a beautiful pale mauve colour. The blooming period is in June when the tree is almost leafless.

The fruit is a capsule, terminated by the remains of the undeciduous style. The seeds are flat and winged.

It is commonly cultivated as a roadside tree and in parks for its beautiful flowers.

Gardening notes : Grown from the seed during the monsoon.

FIG 5. MAUVE TABEBUIA (*Tabebuia speciosa*)

6. THE LAHURA

(Fig. 6)

Tecoma undulata G. Don or *Tecomella undulata* Seem.

Family : BIGNONIACEAE

Other popular name : Wavy-leafed Tocoma
Common Indian names : Hindi—*rugtrora;*
Marathi—*rakhtreora;*
Punjabi—*lahura, luar, regdau, reodhan, rohira, roir.*

Tecoma is derived from a Mexican name of the plant and *undulata* is after the wavy surface of the leaves.

Distribution : Common in the desert areas of Haryana, Rajasthan and Gujarat.

Description : A small tree, very attractive when in full bloom. It has drooping branches and greyish-green foliage.

The leaves are greyish-green with conspicuous wavy edges.

The flowers are large, tubular-shaped and orange yellow in colour, bunches of 5 to 10 are borne at the end of small lateral branches, very handsome when in full bloom from March to April.

The fruit is slightly curved, 8 inches long by ¾ inch broad; seeds are narrowly winged.

Being slow in growth, it is good for a shrubbery or as a dot plant in parks and open places. Extensively planted as an avenue tree on roadsides and also in parks in Chandigarh where it makes a fine display of its orange-yellow flowers in March. Prized for furniture; and being drought-hardy and fire-resistant, it is useful for afforestation and landscaping of dry tracts.

Gardening notes : It is easily propagated from seed or cuttings. Flourishes in dry districts, and also in other places where irrigation is not available.

FIG. 6. LAHURA *(Tecoma undulata)*

7. THE SAUSAGE TREE

(*Fig. 7*)

Kigelia pinnata D.C.

Family : BIGNONIACEAE

Common Indian name : Jhar phanoos

Kigelia is taken from the native name of the tree and *pinnata* refers to the pinnate form of the leaves.

FIG. 7. THE SAUSAGE TREE

Distribution : A native of the tropical West Africa (Mozambique district); equally at home even in the cold climate of the Punjab.

Description : A medium to fairly large size, evergreen, spreading tree with a rounded head and a dense branching system.

Leaves compound, pinnate rough and dark green, developing on the ends of branchlets.

The flowers are large, somewhat cup-shaped, mottled dark-purplish, with a foetid smell and borne in long pendulous racemes which appear like candelabras. It flowers in April-May. It is supposed to be fertilised by bats.

The fruits are large, heavy and sausage- or gourd-like in appearance and hang from long cord-like stalks, sometimes two or three together.

It is a good foliage tree suited for parks. As its leaves are not eaten by cattle, it can be safely grown in areas which cannot be protected.

Gardening notes : Propagated mostly from seed. Under good soil conditions, it can grow well in the humid tropics as well as in the dry arid tracts.

8. THE JACARANDA

Jacaranda mimosaefolia D. Don.

Family : BIGNONIACEAE

Common Indian name : Nili gul mohur R.

Jacaranda is a Brazilian vernacular name and *mimosaefolia* refers to its feathery mimosa-like leaves.

Distribution : A native of Brazil, it is not planted widely in India, except in the north-west. Quite common in the cities of Lucknow, Dehra Dun, Chandigarh and New Delhi where it flowers profusely. It grows in lower Bengal also but there its flowering is poor. It does not flower in Coimbatore.

Description : It is a graceful open-branched tree of medium height with fern-like bipinnate leaves each having many little segments. The tree is leafless for a brief period before flowering.

The blue mauve flowers, borne profusely in loose pyramidal terminal panicles of 40 to 100, are tubular and some are at least two inches long. Their blue colour is very pleasing in the heat of early summer. The tree flowers from the end of March till about mid-May.

The fruit is a flat disc-like woody dehiscent capsule, at first green, but turning brown by the end of the year, containing numerous papery winged seeds.

It is an excellent tree for avenues, parks and gardens and is cultivated for its graceful foliage and beautiful flowers, and pleasant shade. The wood which is moderately hard, heavy and fine-textured is used for making tool handles.

Gardening notes : It is easily propagated from seed or from semi-hard-wood shoot cuttings. In South Florida, quick-flowering jacaranda trees are now produced by grafting buds from aged and blooming trees into small saplings. This beautiful tree, though quick-growing, is

short-lived. It starts flowering at the age of five but after 20 years becomes ugly.

It thrives in well-drained soils and cannot withstand damp. It can be grown in the hills up to an altitude of 5,000 feet.

9. THE TULIP TREE

(*Plate II*)

Spathodea campanulata Beauv. (Syn. *J. acutifolia* Humb. & Bonpl. *J. ovalifolia* R. Br.)

Family : BIGNONIACEAE

Other popular names : Scarlet Fountain Tree, Fountain Tree, Syringe Tree or Uganda Flame Tree, Bell Flambeau Tree.

Common Indian names :Kannada—*nirukavi;* Tamil & Telugu—*patadi.*

Spathode in Greek means spathe and refers to the spathe-like calyx, whereas *campanulata* refers to the cup- or bell-shaped corolla.

The name Fountain Tree originated because the cup-shaped flowers contain water and when squeezed emit a jet-like stream.

Distribution : It is an East African tree, widely planted in Hyderabad and Andhra Pradesh; also found in Chandigarh and New Delhi.

Description : It is a slender, medium-sized and closely branched tree with a rich-brown bark and dark-green foliage.

The large odd leaves, massed at the ends of the branches, are coarsely pinnate, oval in shape and deeply veined. Shoots are velvety and very young leaves are downy underneath. In dry places the tree is deciduous during February.

The flowers are large, globular-shaped and grow in clusters of bright orange-crimson or almost vermilion, borne at the end of the topmost branches. Buds are enclosed in a stout leathery calyx sickle-shaped filled with liquid, which is absorbed by the flower before it opens. The flowering period is from February to March.

The fruit is a capsule pointed at both ends. When in full fruiting, the pods appear like fingers pointing upwards and outwards, above the foliage. Seeds are white, papery and winged. The tree sets seed in Bangalore.

PLATE I. The Silk Cotton Tree (*Bimbax Malabaricum*)

It is a useful shade and avenue tree and appears very attractive when grown in clumps, especially on undulating lands African hunters use decoction of the fruit. The wood, which is white and soft, is suitable for carpentry work and paper-making.

Gardening notes : It is easily propagated from seed, rootsuckers or from cuttings. Demands rich, well drained soil.

It thrives well up to 4,000 ft elevation and is best suited to districts with 20 to 40 inches of rainfall. The wood being soft is liable to injury from stormy winds.

PLATE II The Tulip Tree (*Spathodea campanulata*)

FIG. 8. YELLOW SILK COTTON TREE *(Cochlospermum gossypium)*

10. THE YELLOW SILK COTTON TREE

(*Fig. 8*)

Cochlospermum gossypium D.C. (Syn. C. *religiosum* [Linn.] Alston.)
Family : BIXACEAE

Common Indian names :Hindi—*gooloc, galgal, kumbi;*
Bengali—*golgol;*
Gujarati—*kadachogunid;*
Kannada—*arasiṇaburga, bettatavare;*
Malayalam—*appakutakka, chempani;*
Marathi—*galgal, ganglay, ganeri;*
Oriya—*konto-palas, beniyamrydami, ganiari;*
Punjabi—*kumbi;*
Tamil—*kongilam, tannaku, kannigaram, kattilavu;*
Telugu—*adaviburaga, akshotamu.*

Cochlospermum is a combination of two Greek words, *Kochlos* meaning a shell or snail and *sperma* meaning a seed, probably referring to the fruit characters; *gossypium* refers to cotton, due to the nature of silky wool around the seed.

Distribution : A native of India, Burma and some islands of eastern Archipelago, it is found all over India from Garhwal, Bundelkhand and west sub-Himalayan tracts up to 3,000 ft.elevation, to West Bengal, Bihar, Orissa, central India and the Deccan Peninsula. It is common particularly in hot, dry, stony regions.

Description : It is a small deciduous tree with numerous branches and is characterized by a stout trunk and ash-coloured smooth bark.

Its leaves are distinct, borne towards the ends of the branches, dark-green above, greyish and downy-white below.

When leafless, it bears golden-yellow flowers in terminal clusters

from February to March, which are strikingly beautiful when viewed against the colour of the sky.

Its fruits are large capsules, reddish before drying and contain kidney-shaped seeds which are embedded in silky wool.

Its transparent gum is a substitute for Tragacanth gum and is used commonly by shoe-makers. Leaves and dry flowers are used as stimulants. New leaves are used for hair wash. Seeds are edible and are eaten when roasted. The floss covering of the seeds is used as a substitute for Java kapok or Indian kapok for stuffing mattresses, pillows and cushions, and also for lifebelts. Wood decoction mixed with flour is nutritious and is used as a medicine.

Being a xerophyte, the tree is ideally suited for avenues especially for the drier tracts. It is useful in the afforestation of bare, rocky and denuded hills, as it is able to withstand forest fire. It is often cultivated in gardens and near temples for its beautiful yellow flowers.

Gardening notes : It can be easily propogated from seed. When under cultivation, the tree tends to be tall and slender in habit.

11. THE BARNA

(*Fig. 9*)

Crataeva religiosa Hook. f. & Thoms. non. forst. F. (Syn. *C. nurvala* Buch.—Ham.)

Family : CAPPARIDACEAE

English names : Caper tree, the scared Barna.

Common Indian names : Hindi—*barna, bilasi;*
Bengali—*barun;*
Gujarati—*varno;*
Kannada—*hole tumbe;*
Malayalam—*kili;*
Marathi—*baravarna, vava-varna;*
Oriya—*barun;*
Punjabi—*barna;*
Tamil—*adicharanam, mara-lingam;*
Telugu—*ulimari.*

Crataeva is named after a Greek botanist Crataevus, and *religiosa* pertains to religion; *Nurvala* is a south Indian vernacular name.

Distribution : Found almost throughout India, either wild or cultivated, but most common in Uttar Pradesh. Also common in Burma and Ceylon.

Description : A small or medium-sized much-branched deciduous tree with crooked branches, smooth pale-grey bark and glossy foliage.

Leaves are compound, of 3 leaflets on a common stalk. It is leafless during cold weather and new leaves appear in February March.

The flowers are white, pale-yellow or reddish-yellow, borne in dense corymbs at the ends of the branches having numerous

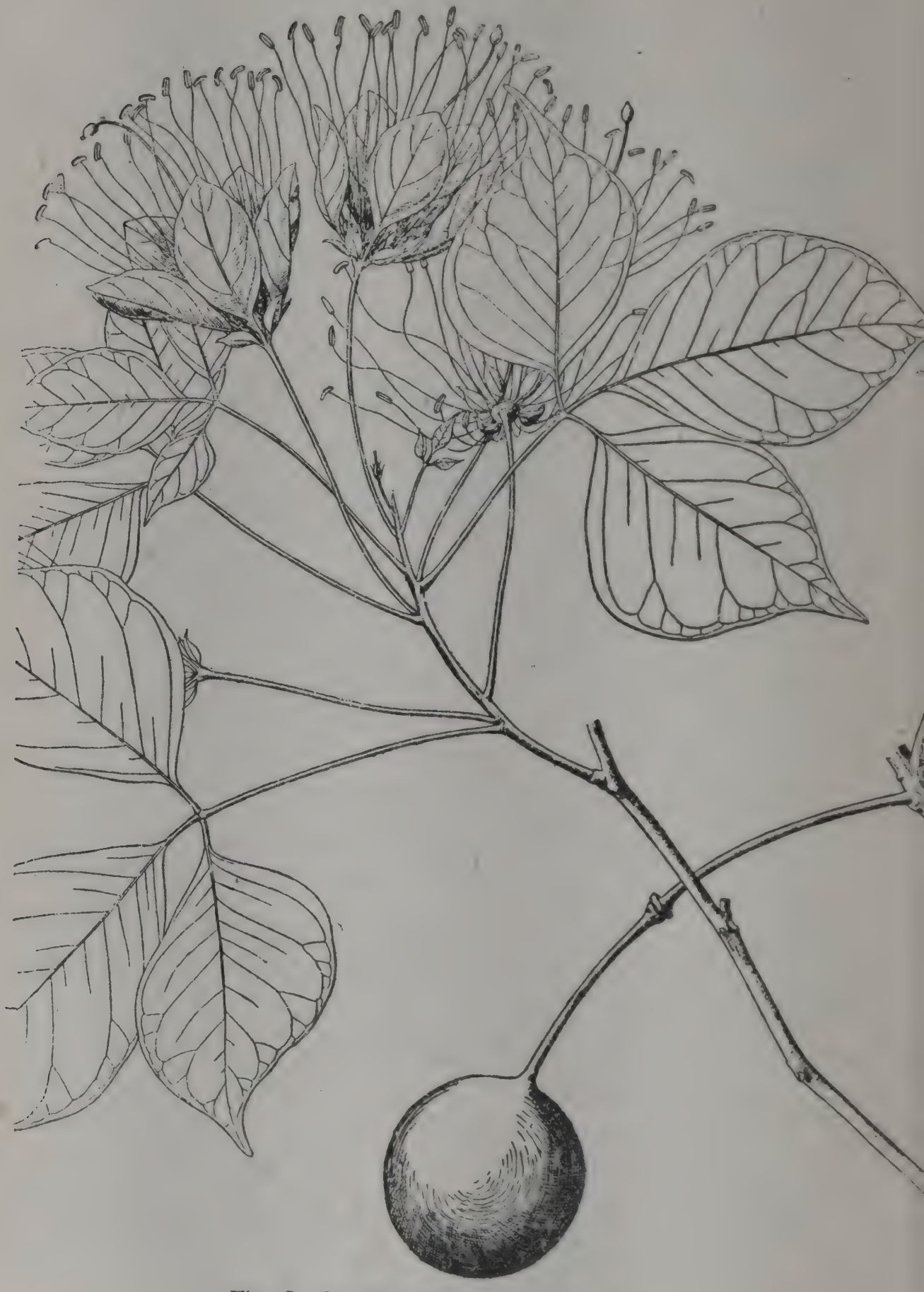


Fig. 9. BARBA (*Crataeva religiosa*)

prominent stamens with purple filaments. It is handsome when it flowers in a leafless condition in April-May.

The fruit is a berry, globose or oblong in shape, with a woody rind, at first green, but turning scarlet on ripening. Its fruit when ripe smells like stale beer. The seeds are embedded in a yellow pulp.

The wood, though fairly hard, is not durable, and is used in making drums, match sticks, combs and turnery articles. The rind of the fruit is used as a mordant in dyeing. Leaves and bark are used medicinally. Bark extract, which contains tannin and also saponin, is used as a laxative and appetizer. It is also reported to be useful in affections of the urinary organs.

It is suitable for ornamental planting in public parks and open spaces in towns. It can stand drought and is suitable for dry localities.

Gardening notes : The plants are raised from seed in the monsoons. It can also be propagated from rootsuckers. The seed ripens about July, but being hard may sometimes take about a year to germinate. It is sensitive to frost in its early years.

It is a very hardy and drought-resistant tree. The growth is rather slow. The leaves are easily eaten by the cattle and hence it needs protection from stray cattle.

FIG. 10. SCARLET CORDIA *(Cordia sebestena)*

12. THE SCARLET CORDIA

(*Fig. 10*)

Cordia sebestena Linn.

Family : BORAGINACEAE

English name : Aloes-wood or Scarlet Cordia

Common Indian names : Hindi—*lal lasora R. bhokar;*
Kannada—*challekendala;*
Tamil—*aechinaruvihli;*
Telugu—*virigi.*

The name *Cordia* is in honour of a German botanist, Valerius Cordus, of the sixteenth century and *sebestena* is derived from an allied Persian species, *Sapistan*, grown around the town of Sebesta ; also meaning fruits like sebestens.

Distribution : A native of Cuba, it occurs throughout India even up to elevation of 5,000 feet in the Himalayas.

Description : It is a small deciduous tree or garden shrub of dwarf habit, in native forests rising to 40-50 feet, with short crooked trunk and the brown bark characterized by ridges.

The leaves are large, oval with blunt apex and deeply indented veins, unusually dark-green and wrinkled, harsh-textured like sandpaper.

Flowers occur in large open clusters at the ends of branches, brilliant orange red or true scarlet, bell-like in shape, and scattered in the deep foliage presenting a rich hue. It flowers in January through March or practically throughout the year.

The fruit is a pure white berry, very distinctive, being enclosed in the remains of the calyx and containing a sticky pulp in which the seeds are embedded.

It is highly valued as an ornamental tree.

Gardening notes : It is propagated by seed or by layers. Its growth is quite rapid. The seed ripens in June-July and the stones should be removed from the pulp before sowing.

13. THE ARJUNA

(*Fig. 11*)

Terminalia arjuna Bedd.

Family : COMBRETACEAE

Common Indian names : Hindi—*arjun;*
Tamil—*vellamarda, kula-maruthu;*
Telugu—*yermaddi.*

Terminalia is derived from the Latin *terminalis*, meaning flowers appearing terminally and *arjuna* is from a Hindi name of the tree, *arjun.*

Distribution : It is found throughout India, Burma and Ceylon, usually on the banks of rivers and streams.

Description : A large evergreen tree with smooth grey bark, often tinged with green and red.

The leaves are oblong, opposite and sub-opposite. The leaves on the lower surface usually carry a pair of prominent glands close to the top of the leaf-stalk.

The flowers are pale-yellowish-white, cup-shaped, resembling myrobalan, small and crowded on a long axis. It flowers from March to June when its honey attracts swarms of bees.

The fruit is a winged nut, the leathery wings are usually five in number and are closely veined, the veins not spreading horizontally but tending to curve upwards. The fruit is tan-coloured when dry.

It is an excellent shade-tree and is often planted on road-sides. The bark is used in medicine as a tonic and also for tanning and dyeing. The gum is also used as a drug. The wood is used in making agricultural implements, boats and carts.

FIG. 11. ARJUNA *(Terminalia arjuna)*

Gardening notes : It is commonly propagated from seed. The fruit seed should be sown half above ground. If buried deep, it fails to germinate. Can be easily transplanted when a year old. A deep and fairly moist soil is conducive to its growth.

FIG. 12. CHALTA *(Dillenia indica)*

14. THE CHALTA

(*Fig. 12*)

Dillenia indica Linn.

Family : DILLENIACEAE.

Common Indian names :Hindi—*chalta;*
Bengali—*chalita;*
Kannada—*bettadakanagal;*
Gujarati—*karmbal;*
Malayalam—*chalita;*
Marathi—*karmble;*
Oriya—*chalota;*
Telugu—*kalinga.*

Dillenia is named after a noted botanist, J.J. Dillenius, and *indica* refers to its Indian origin.

Distribution : Common in Bengal, Bihar and Assam; also extending to Indo-China, Borneo and Java.

Description : An erect evergreen tree with a rounded crown, spreading branches and handsome bright-green foliage. The bark is smooth and red, peeling off in scales.

The leaves are broad, pointed with toothed margins, growing at the ends of the branches. The leaf-stalk is channelled. The veins, closely set and running parallel to the toothed margins, give the leaves a deeply fluted surface. The upper surface of the leaves and the veins below are downy.

Flowers are large, white and fragrant, borne singly at the ends of branches in July.

The fruit is large and hard.

Gardening notes : It is propagated from seed sown in monsoons Flourishes in moist localities and loves frostless situations. Suitable for growing in compounds of small houses.

FIG. 13. RHODODENDRON (*Rhododendron arboreum*)

15. THE RHODODENDRON

(*Fig. 13*)

Rhododendron arboreum, Smith.

Family : ERICACEAE

Other popular name : Buras.

Distribution : Common in the Himalayan ranges, particularly the Simla Hills.

Description : It is a large shrub or tree, attaining a height of about 40 ft.

The leaves are 4-6 inches long, oblong to lanceolate, acute, rugose above, distinctly veined and whitish beneath.

The flowers are in dense clusters and are of red colour. The pedicles are short with minute calyx and campanulate corolla. It flowers in the Himalayas from March to May, when hill-sides are a scarlet gleam. Flowers are acid in taste and are used for *chutney*-making by the hill people.

Gardening notes : Grows on acidic soils.

16. THE CHINESE TALLOW TREE

(*Fig. 14*)

Sapium sebiferum Roxb.

Family : EUPHORBIACEAE

Common Indian name : Hindi—vilayati shisham.

Distribution : Native of China, commonly grown in the Kangra district of Himachal Pradesh, and near Saharanpur and Dehra Dun.

Description : It is a medium-sized deciduous tree with leaves resembling those of *shisham*. In autumn, leaves turn bright scarlet and present a beautiful sight.

Gardening notes : The seeds are coated with white wax and germinate easily. The tree is extremely frost-resistant. An excellent tree for growing on moist land near rivers and streams. Grown in clumps in parks, it presents a beautiful sight in autumn, reminding one of the autumn coppery tints of maples in the U.S.A.

FIG. 14. CHINESE TALLOW TREE *(Sapium sebiferum)*

17. THE CEYLON IRON-WOOD TREE

(*Fig. 15*)

Mesua ferrea Linn.

Family : GUTTIFERAE

Common Indian names : *Naka, Nagkesar.*

Distribution : Grown in Ceylon near Buddhist temples. Suited to hot and moist areas. Common in Assam.

Description : A medium-sized tree, producing large white flowers in April-May, with a central bunch of yellow stamens.

Young leaves are deep crimson above and silvery below. They lose their colour very quickly. The wood is very hard.

Gardening notes : Grown from seed.

FIG. 15. CEYLON IRON-WOOD TREE *(Mesua ferrea)*

18. THE AMLA

(*Fig. 16*)

Phyllanthus emblica Linn.

Family : EUPHORBIACEAE

Other popular names : The Emblic myrobalan, Indian gooseberry, Malacca tree.

Common Indian names :nelli aonla, amlakai.

Phyllanthus is derived from two Greek words *phullon* meaning a leaf and *anthos* a flower, the whole meaning leaf-flower referring to the apparent bearing of flowers on the leaves. *Emblica* is derived from the earlier name of this tree *Myro-balanus emblica* or its fruit is called by the early pharmacists as *Emblic myroballan.* It is probably derived from the Persian *amlah* and *Arabic ambalji.*

Distribution : Throughout India, excluding the arid regions. Also common in Burma. The grafted variety from Banaras is exceedingly handsome. and bears large-size fruit.

Description : A very handsome medium-sized deciduous tree with smooth grey bark and mottled stem.

Feathery small leaves are fine and delicate. The tree has a peculiarity of shedding its twigs along with the leaves attached.

Flowers are very small, greenish and are borne in clusters often on the naked portion of the twigs below the leaves. The flowering period is from March to May.

Fruits ripen from November to February, and are yellowish-green, fleshy and rich in vitamin C.

Cultivated mostly for its fruit which has medicinal value. The fruit, bark and leaves are used in tanning and dyeing. Fruits are pickled and also eaten fresh. The timber which is hard and red is little used as it splits badly.

FIG. 16. AMLA *Phyllanthus emblica)*

Gardening notes : Commonly propagated from seed. Inarched plants are also common. Much of the seed is infertile. Ripe fruits are left in the sun till they dry and the stones split, allowing the seed to escape. The seed is better sown in March and is continuously watered. Growth is fairly rapid during the first few years, but later on slows down considerably.

19. THE PONGAM

(*Fig. 17*)

Pongamia glabra Vent. (Syn. *P. pinnata*)

Family : LEGUMINOSAE (*Papilionaceae*)

Common Indian names :Hindi and Bengali—*karanj, paper, papre, kanji;*
Malayalam—*unne;*
Tamil—*pargam, punku;*
Telugu—*pungu.*

Pongamia in Tamil is after the tree *ponga* or *pongam* and *glabra* in Latin means smooth or without hairs.

Distribution : Wild in most parts of India and Burma along sandy beds of streams and the sea coast. Very common in the forests of central India.

Description : A dwarf deciduous tree with short bole and spreading shady crown having smooth grey bark.

Trifoliate leaves are bright-green and glossy. Leaves often marred by the presence of insects which make ugly patches under the surface tissue.

Flowers half an inch long, lilac or mauve-coloured resembling those of Milletia, borne in short racemes in the axils of the leaves. Flowers in leafless condition in the last week of April to May. When the tree is laden with flowers, it is really worth seeing.

Woody fruit pods, yellowish-grey turning dark-grey finally; and indehiscent. Pods ripen in March-May of the following year.

Mainly used as a shade tree or for ornament planting. Very suitable for road-side avenues. Suitable for planting on railway stations platforms. Its leaves provide green manure, and it is used for cure of skin diseases. They also drive away white-ants.

FIG. 17. PONGAM *(Pongamia glabra)*

Gardening notes : It is raised from seed in rains. Can also be propagated from cuttings. It is fast-growing.

20. THE NOBLE AMHERSTIA

(*Fig. 18*)

Amherstia nobilis Wall.

Family : LEGUMINOSAE (*Caesalpiniodese*)

Other popular names : Thawka (Burmese), Splendid Amherstia, Flame Amherstia.

Amherstia is after Countess Amherst and her daughter Lady Amherst, who were interested in Indian plants and *nobilis* refers to the graceful beauty of the flowers.

Distribution : Native of Burma, it is found mostly in Bengal and other humid localities. Specimens can be seen in some of the gardens in Calcutta and Trivandrum.

Description : It is a medium-sized evergreen tree, with compound paripinnate and drooping leaves. The young leaves are flaccid and pendent, and are of charming appearance being either of pale copper or purple hue, before finally turning green. The stout tree trunk has uneven, dark ashy-grey bark.

Flowers are large, sprays of vermilion red sipped with golden yellow spots on petals, and arranged in long, pendent candelabra-like racemes arising in the axils of the leaves. The tree flowers in November and April. The flowers last only for two to three days.

The fruit is a flat pod and is beaked.

It is cultivated for its beautiful flowers.

Gardening notes : Propagated by seed or by cuttings. It thrives best in humid localities with warm climate. Gets damaged in northern India on account of hot dry winds and frost. The trees need to be protected against strong winds and hot sun.

It is also grown from layers in the hot season, and is transplanted during the rains. In certain situations it seldom seeds.

FIG. 18. NOBLE AMHERSTIA *(Amherstia nobilis)*

It is suitable for tropical southern India and eastern India and does not flourish in northern India.

21. THE TAMARIND OR IMLI

(*Fig. 19*)

Tamarindus indica Linn.

Family : LEGUMINOSAE (*Caesalpiniodeae*)

Other popular name : Indian Date

Common Indian names : Hindi—*imli, imlee, ambli;*
Bengali—*taetul;*
Malayalam and Tamil—*puli;*
Marathi—*amli;*
Telugu—*chinta.*

Tamarindus is derived from the Persian name *tamar-Hind,* meaning Indian date, *indica* refers to its Indian origin.

Distribution : Believed to be a native of tropical Africa, but now cultivated throughout Asia and America. Common in India. Fine specimens of *imli* tree can be seen in Oudh, the eastern part of Uttar Pradesh.

Description : A handsome evergreen tree, with dark-grey rough bark and a large spreading crown. It has a short, strong trunk. The bark is covered with longitudinal fissures and horizontal cracks.

Leaves are compound with 10-20 pairs of small leaflets.

Flowers are in racemes at the ends of the branches and are lateral sprays. They are inconspicuous, about half an inch long, variegated yellow and red, appearing in April-June.

Fruit pods are filled with dark-brown fibrous, acidic pulp, containing 3-12 smooth shining seeds. They ripen in November-December. There is a variety with sweet pulp, and another with a reddish pulp which is considered to be the best.

An excellent tree for road-side avenues and useful for its fruit and highly prized timber. The pulp of the fruit is a favourite ingredient of

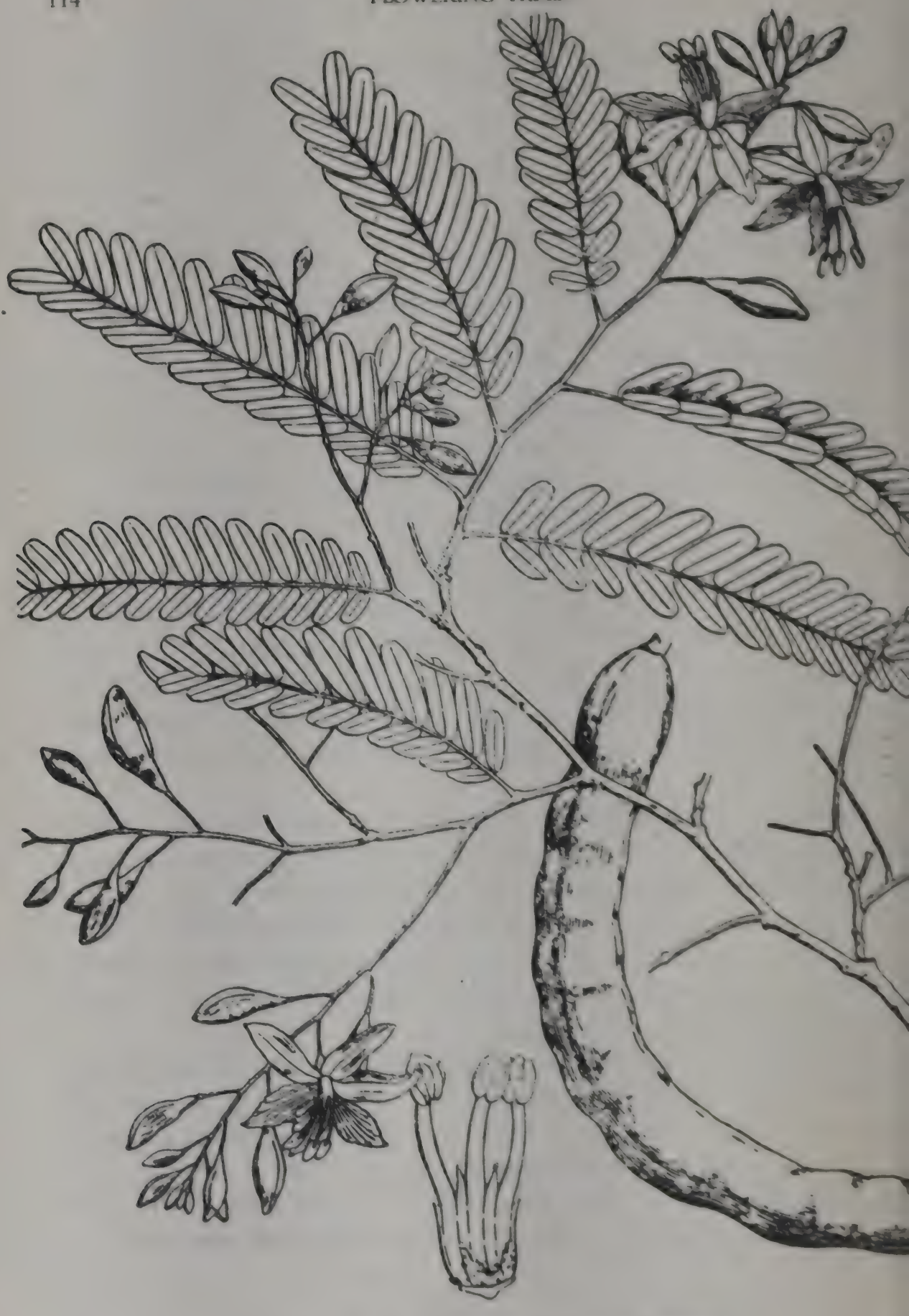


FIG. 19. TAMARIND (*Tamarindus indica*)

condiments, and is used in general cooking and *chutnies*. Leaves and flowers are also edible. Its timber is very hard and is thus unworkable; used for mallets, rice pounders, oil presses, etc. Pulp is pressed, preserved and sold by weight in the markets. Seeds yield a cheap substitute for cereal starch, used for sizing cotton yarn, jute fabrics and woollens. Husks of seeds are also used for road surfacing. In ancient times tamarind groves were avoided for camping, as the acid in fallen leaves damaged the cloth of tents.

Gardening notes : Grown from seed in March-April and is transplanted.

22. THE ASHOKA

(Plate III)

Saraca indica Linn. (Syn. *Conesia asoka* Roxb)

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Common Indian names : Hindi—*ashok, sita asoka* R.;
Bengali—*asok, asoka*;
Gujarati—*ashopalava*;
Kannada—*asoka*;
Malayalam—*asok, hema-pushpam*;
Marathi—*ashoka, jasundi*;
Oriya—*osoko*;
Tamil—*asogam*;
Telugu—*asokamu*.

The exact origin of the name *saraca* is doubtful; *indica* means 'of Indian origin'. *Jonesia* is after the British scholar, Sir William Jones, and *asoka* pertains to the old Sanskrit name *Ashoka*.

Distribution : Native of India, Burma and Malaya, it is found commonly in Bengal. Found wild in the evergreen forests of the Khasia Hills in Assam, the northern Circars and on the west coast of Bombay. Cultivated in gardens in Calcutta, Lucknow and other places. Also common in Ceylon.

Description : It is a very handsome small evergreen erect tree, with branches spreading in all directions and forming a dense closely leaved and shapely crown. The trunk is covered with smooth dark-brown or greyish-brown bark

The foliage is deep-green and shiny. Each leaf is a foot long, having 3-7 pairs of wavy-edged leaflets. Young leaves are drooping, coppery-

PLATE III The Ashoka (*Saraca indica*)

red and flaccid and remain pendent even after attaining full maturity. The leaves grow alternately on the branches.

It flowers in large compact orange-red clusters, in February-March. The profusion of orange red flowers against the deep green foliage present an object of startling beauty. The Hindus regard it as sacred, being dedicated to Kama Deva, God of Love. The Buddha was born under an Ashoka tree, hence it is sacred to the Buddhists. It is extensively planted in monastery gardens in Thailand and Burma. The tree became a symbol of fertility and was extensively sculptured in Buddhist temples of Kushan Mathura, Sanchi, and Bharhut. The leguminous fruit pod is fleshy red, when unripe, and closely resembles the tamarind pod.

It is one of the prettiest Indian trees, cultivated in gardens providing thick shade. Owing to its spreading habit, it is best grown in a clump in an open space. A decoction of its bark is used in uterine affections. The pounded flowers mixed in water are used in dysentery.

Gardening notes : Easily propagated from seed. In northern India, it should be planted in sheltered places to save it from hot winds. Very suitable for southern and eastern India.

PLATE IV The Gul Mohur (*Poinciana regia*)

23. THE GUL MOHUR

(Plate IV)

Poinciana regia Bojer (Syn. *Delonix regia* Raf.)

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Peacock Flower, Flamboyant or Fleur de Paradis, Gold Mohur.

Common Indian names : Hindi—*gul mohur*;
Kannada—*doddaratna-gandhi*;
Malayalam—*alasippu*;
Marathi—*gulmohr*;
Tamil—*mayirkkondrai, mayarum*;
Telugu—*ettaturavi, shima sankesula*.

Poinciana is named after the governor of West Indies, M. de Poinci, an enthusiast in botany and *regia* in Latin means royal.

Distribution : Indigenous to the island of Madagascar, it is found practically all over India in the tropical and sub-tropical plains.

Description : It is a large nearly evergreen open-branched spreading tree, irregularly shaped, more umbrella-like, with light feathery foliage.

The long leaves are bipinnate, each pinna bearing 20-30 tiny leaflets, thus giving a graceful feathery look to the tree. Leafless in March.

A brilliant mass of large scarlet flowers, sometimes varying to light-orange or deep-crimson, with spreading 'racket shaped' petals which are borne in large bunches along and at the ends of the branches. The flowering time is April-June, with a second flush in July. Sometimes, there is a third flush coinciding with the end of the monsoon. A variety with giant flowers in the Lac Research Institute at Ranchi.

Fruit pods are 12-14 inches long by about 2½ inches wide, forming

at the end of the flowering period, first green but soon turning black and hard.

It is most valued as a tree for avenue and ornamental planting, especially when grown alternately with *amaltas*. The flowers and buds are often used as a potherb.

Gardening notes : It may be propagated by seed or by cuttings. Seeds being hard and bony often take a long time to germinate. Therefore, the seeds are given a hot-water treatment, i.e. by soaking in hot water for eight minutes before sowing.

It is a quick-growing tree which comes into flower within 4 to 5 years of seed sowing. It is difficult to rear in cold climates due to its susceptibility to frost. This can be avoided by covering the young plants by a thatch covering, till they become strong enough to withstand the vagaries of weather.

Another species, *Poinciana elata* Linn. (Syn. *Delonix elata*) is cultivated in India and called white *gul mohur*. It carries the following local names :

Hindi—*sankesar*; Marathi—*sandesara*, *sankasura*;
Gujarati—*sandesra*; Oriya—*simamondaro*;
Kannada—*kempukenjiga*; Tamil—*padenarayan*;
Telugu—*chilikeswarapu*.

It is a short and stumpy tree with umbrella-like crown. It gets laden with whitish yellow or cream-coloured flowers in February-March, which provide a pleasant contrast with its bright green, feathery leaves. Commonly grown in Madhya Pradesh, Hyderabad (Andhra Pradesh) and Saurashtra in Gujarat.

It was introduced into India by the Arabs from Abyssinia.

24. PINK CASSIAS

(*a*) THE JAVA CASSIA

(Plate V)

Cassia javanica Linn. (Syn. C. hacillus)

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Common Indian name : Hindi—*java-ki-rani* R.

For *Cassia*, see *C. fistula* (*amaltas*); *javanica* refers to its Javanese origin.

Distribution : A native of Malaya and Java, it is grown in most of the States in India. Very common in Chandigarh and Bangalore where it is grown in the form of avenues.

Description : A most beautiful cassia of medium size, the straight trunk supporting a spreading crown with horizontal branches and numerous drooping feathery leafed branchlets. It is slightly taller than *C. nodosa.*

The leaves are distinct from those of *C. nodosa* in being bluntly rounded. In May, the new flush of leaves is accompanied with clusters of deep-pink buds, grouped in whorls at the end of short lateral branchlets.

The clusters of pink flowers too are borne loosely on the branches in May-June for a brief period. These pink-flowered clusters, intermingled with the foliage, distinguish this cassia from the Burmese Pink Cassia which flowers in leafless condition.

Gardening notes : It requires a sheltered situation, as the wood being brittle is liable to injury from strong winds

(*b*) CASSIA NODOSA

Distribution : This Cassia is a native of Burma, Malaya and parts of

northern India, more so of Assam. It has been extensively planted in Chandigarh. In May, its avenues in Chandigarh present a unique spectacle of beauty in blossoms. The tree is very similar in general habit to *C. javanica*.

Description : It is a large tree with a short gnarled trunk and spreading crown. The pinnate leaf, 6 inches to a foot in length, is composed of 6 to 14 pairs of smooth leaflets without an odd terminal leaflet, the leaflets, being pointed or lance-shaped.

The pink flowers are borne in large closely formed clusters or bunches, looking like bunches of roses and arising prominently from the nodes (hence the specific name *nodosa*) almost along the entire branching system. The stamens are long and swollen in the middle. This is another explanation for the specific name *nodosa*. The tree flowers from May to June when in leafless condition, leaves appearing in the lower branches first. The tree is most beautiful of all the flowering trees and is at its best in June.

This flowering tree is most suitable for parks, avenues and medium-sized gardens.

Gardening notes : The young trees should be staked, as they have a tendency to lean over. Seeds rubbed on a stone till white shows germinate well.

(*c*) THE BURMESE PINK CASSIA

C. renigera Wall.

For *Cassia* see *C. fistula*; *renigera* refers to the kidney-shaped stipules found at the base of the leaves.

Distribution : Native of Burma, it is found commonly in Maharashtra and Madras.

Description : It is a medium-sized deciduous tree, 18 to 20 ft high.

Clusters of flowers arise on short stems from the scars of old leaves. It flowers in May-June just before the monsoons. The leaflets are pointed at apex, and are leathery and glossy. A large kidney-shaped bract is found at the base of the leaf-stalk of the young leaves, which fall off later.

Gardening notes : Grown from seed. It flowers in the fourth or fifth year of its planting. The Cassia, though not long-lived, has a quick-growing habit.

In the case of all the species of Cassia, seed should be immersed in boiling water, which should be allowed to cool down. This is necessary, as the seedcoat is hard and must be softened before sowing.

25. THE PURPLE BAUHINIA OR THE MOUNTAIN EBONY

(*Fig. 20*)

Bauhinia purpurea Linn.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Mountain Ebony, Geranium tree.

Common Indian names : Hindi—*gulabi kachnar R, gairal, kaliar*;
Bengali—*devakanchan, koiral, rakta kanchan*;
Kannada—*basavanapadu*;
Marathi—*atamtti*;
Oriya—*boroda*;
Tamil—*kalavilaichi, mandari*;
Telugu—*bondanta, kanchanam*.

Bauhinia is named after two botanists, John and Caspar Bauhin, who were twin brothers, and *purpurea* refers to purple red flowers.

Distribution : Found practically wild throughout India particularly along the foothills of the Himalayas (hence the name Mountain Ebony) from Indus to Assam. Also found on the hill ranges of central and southern India. Grown extensively as an avenue tree in Chandigarh.

Description : It is a medium-sized evergreen tree, densely branched with rounded crown, having smooth ashy-grey or brown bark. There are many references to this tree in the Sanskrit dramas of Kalidasa, who calls it *kovidara*.

Leaves are simple and bilobed, cleft about half-way down with 9-11

FIG. 20. PURPLE BAUHINIA *(Baubinia purparea)*

strong nerves radiating from the base. The leaf is split down in the middle, giving a hoof-like appearance. This character makes *Bauhinia* easily recognizable.

The buds are five-angled, dark-green or brown and downy. On opening, the calyx splits into two reflexed segments, one having two wings and the other three.

Flowers, as a rule, are deep pink or rosy purple (purple to lilac or red), large and showy, and are five-petalled, clawed or pointed. At times, the base of one petal is white. It flowers profusely in November.

Profuse flowering is followed by long, sword-like green pods, looking like the French beans among the foliage.

The bark is used for dyeing and tanning and sometimes for fibre also. The flowers are pickled or used as vegetable. The bark of the underground root is poisonous. The wood is used for agricultural implements and for building.

The tree is mainly used for ornamental planting and is admirably suited for small gardens and road-side avenues.

Gardening notes : It is easily grown from seed. The seeds are sown in lines in the beginning of the monsoons. The seedlings appear in about 4 to 10 days and are transplanted during rains. The branches which lean out are cut off.

It flourishes in high well-drained soil. It is easily affected by low temperatures. It is a beautiful tree which deserves greater popularity on account of the fact that it is one of the few trees which flower in winter.

26. THE KACHNAR OR VARIEGATED BAUHINIA

(Plate VI)

Bauhinia variegata Linn.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Hindi—*kachnar* (baisakhi);
Bengali—*bidul, kovidara*;
Kannada—*arisinantigi*;
Malayalam—*kovidaiam*;
Marathi—*kanchan*;
Oriya—*boroda*;
Tamil—*mandarai*;
Telugu—*bodanta*.

For *Bauhinia*, see under *B. purpurea*. *Variegata refers to the variegated flowers.*

Distribution : Indigenous to India, it is found throughout the country. Common in the sub-Himalayan tracts from the Indus towards Assam, Chota Nagpur, Madhya Pradesh and western Peninsula. Very common in the Kangra Valley, where it is grown in every village.

Description : It is a small tree with openly branched irregular crown with brown and slightly rough bark.

Leaves split down the middle, with 11-15 strong nerves, radiating from the top of the stalk. Leaves fall in February when the tree is bare.

The specimens are specially attractive for their gnarled trunks and are clothed in a rough bark, which gives an appearance of great age, though they rarely live beyond 60 or 70 years.

Flowers are large, white with light-yellow spots on pink with red spots, or purple-mauve and are orchid-like in shape. They appear when the tree is in a leafless condition from February to March. The trees when in bloom present a beautiful sight.

PLATE V The Pink Cassia (*Cassia Javanica*)

The flower buds are popular as a vegetable. The timber is hard and is used for fuel and for making agricultural implements. The bark is used medicinally and the trees are often seen damaged due to its removal. The bark is used for tanning and dyeing. Leaves are used as wrappers for *bidis*. The tree also yields a gum, possessing properties similar to those of the cherry gum. The seeds yield an oil.

The pods are long and narrow and contain 10 to 25 seeds.

It is a very beautiful tree and an avenue of pink, white and purple varieties presents a heavenly sight.

Gardening notes : Commonly propagated from seed. It is fast-growing in early stages, and attains a height of six to eight feet in the first season of its planting and flowers during the second year. Cuttings root with difficulty. An excellent tree for parks and open places.

Another variety, *B. triandra* Roxb., commonly known as Pink Bauhinia or *lal kachnar* R. in Hindi, is a small bushy tree, with pinkish flowers and is in bloom from October to November.

PLATE VI The Kachnar or Variegated Bauhinia (*Bauhinia variegata*)

27. THE INDIAN LABURNUM OR AMALTAS

(Plate VII)

Cassia fistula Linn.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Golden Shower, Pudding Pipe Tree.

Common Indian names : Hindi—*amaltas*;
Bengali—*bandarlati, amultas, sondal*;
Kannada—*kakke*;
Malayalam—*babava, bhava*;
Oriya—*sandari*;
Punjabi—*alash*;
Tamil—*appai, konnai, tiru kontai*;
Telugu—*relu, aragvadhamu*.

Cassia is the old Greek name of Dioscorides (probably a classic name of a tree with aromatic bark, perhaps of a species of wild cinnamon); and *fistula* in Latin means pipe, referring to the shape of the pod.

Distribution : Native of India, it is found throughout the deciduous forests and plains of the country, ascending to the foothills of the Himalayas. Also found in Burma, Java, Viet Nam and the Philippines.

Description : It is a small-to medium-sized open-branched, deciduous and hardy tree with smooth greenish-grey bark on young trees, turning to brown and rough in older trees.

Leaves are large and coarsely pinnate. The fresh leaves are often of a rich copper colour with a soft downy undersurface, and remain

pendulous and folded until fully grown. Leaves fall in March-April and the first half of May.

Amaltas is most conspicuous in the hot weather due to long golden-yellow pendent flowers which appear in April-May. It is nearly leafless at the time of flowering, the first splashes of gold appearing as the last of the old leaves are shedding, and the flowering continues till the new leaves develop.

Fruit pods are long and rounded, 1-2 ft in length and ¾ inch in diameter, and are dark-brown.

The wood is hard and is used in making carts and agricultural implements. Bark is used for tanning. The dark-brown sweetish pulp is laxative and is used medicinally. The pulp, in Bengal is also used to flavour tobacco. The Santhals in Bihar use the flowers as food.

It is suitable for parks, gardens and avenues.

Gardening notes : It is commonly propagated from seed. It is advisable to plant more seeds, even though a few plants may be required, for the germination is poor. Germination is hastened by boiling the seeds for five minutes before sowing to soften the hard seedcoat. The seedlings are transferred to baskets in the first rains.

Trees are often defoliated by caterpillars. It is advisable to keep a watch on young trees and remove the caterpillars.

It is a hardy, xerophytic tree, not eaten by goats or cattle. Hence it can be grown in places invaded by cattle. It is suitable for dry districts.

The trees are slow in growth and attain good proportions only after about ten years. Under favourable conditions, the young trees come into bloom after five years of planting.

FIG. 21. WEST INDIAN MOUNTAIN ROSE *(Brownea coccinea)*

PLATE VII The Indian Laburnum or Amaltas (*Cassia fistula*)

28. THE WEST INDIAN MOUNTAIN ROSE

(*Fig. 21*)

Brownea coccinea Loeff. ex. Griseb.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Distribution : Native of Venezuela. Specimens can be seen in gardens of West Bengal, Uttar Pradesh, Mysore and Kerala.

Description : It is a small tree, 8 to 10 feet high, of handsome compact growth, with dazzling heads of scarlet flowers scattered in the foliage. However, there is no mass-flowering.

It has two unique features : its leaves and the manner of blooming. The new leaves are first developed within a long pencil-like appendage which suddenly unfolds fully formed leaves which are often bright purple and handsomely mottled. They quickly straighten out into smooth dark-green leaves. The flowers, 30-50 together in six-inch heads, are borne profusely all over the trunk, from the base to the crown, and are rarely seen on the larger limbs.

Gardening notes : It is commonly propagated by layers.

It does well in moist climate and is hence unsuitable for northern India due to hazard of hot winds. It can, however, be grown in sheltered spots. It is suitable for coastal areas of southern or eastern India.

PLATE VIII The Colvilles Glory Tree (*Colvillea racemosa*)

FIG. 22. COLVILLE'S GLORY *(Colvillea racemosa)*

29. THE COLVILLE'S GLORY

(Fig: 22 Plate VIII)

Colvillea racemosa Bojer

Family : LEGUMINOSAE (CAESALPINIODEAE)

Common Indian name : Hindi—*kilbili.*

Colvillea is after Sir Charles Colville, and *racemosa* refers to raceme flowers.

Distribution : Native of East Africa or West Coast of Madagascar. Common in Bangalore as an avenue tree. Also grows in Alfred Park, Allahabad.

Description : A medium-sized tree with umbrella-like habit, resembling *gul mohur* when not in flower. The leaves are pinnate, composed of from 20 to 30 pinnae.

It flowers in July-August to October, orange to red in large drooping racemes at the ends of the branches. They can be compared to bunches of grapes coloured orange-red. Stamens are large and prominent. Flowers appear in a scarlet fringe on the top of the crown and are a glorious sight. The flower buds are very striking in appearance. They are nut-like in form, appearing in large drooping clusters, and diminishing in size while approaching the raceme end.

The fruit is a pod, two-valved and rounded in cross section. It is planted as an ornamental tree in parks and gardens.

Gardening notes : It is propagated from seed. It sets seed in south India. As the flowers are terminal, the tree should not be pruned. It is suited to moist or moderately dry low country.

FIG. 23. MOULMEIN ROSEWOOD *(Milletia ovalifolia)*

30. THE MOULMEIN ROSEWOOD

(*Fig. 23*)

Milletia ovalifolia Kurz.

Family : LEGUMINOSAE (PAPILIONACEAE)

Distribution : It is a small tree with beautiful lilac-coloured flowers, appearing in leafless condition and entirely covering the tree. Its mauve and lilac flowers are a glorious sight in April.

It is suitable for compounds of houses as well as for parks and open places.

Gardening notes : Grown from seed.

31. THE SESBAN OR AGASTYA

Sesbania grandiflora Poir.

Family : LEGUMINOSAE (PAPILIONACEAE)

Sesbania is probably from Arabic S. *aegyptiaca* common to Egypt and *grandiflora* refers to the large and handsome flowers, perhaps the largest of the pea family.

Distribution : From Mauritius, India to North Australia.

Description : A small quick-growing tree with pinnate leaves. Flowers large, pea-shaped, borne-singly or in short racemes in the axils of the leaves. There are two varieties with salmon pink flowers and cream-coloured flowers. The flowering period is in December-January. Flowers of pink variety open at dusk when they are pale greenish white but by the morning turn pink. The flowers are perhaps pollinated by bats which visit them for nectar.

Fruit pods are long and narrow.

Often cultivated in gardens for its showy flowers. Flowers eaten in the form of *pakoras* (a type of snack). Tender leaves and pods are also eaten. Certain parts of the tree are used medicinally.

Gardening notes : It is easily raised from seed in the rains. Yields a fine hedge in a year and flowers in the same year. Also used as a green manure plant.

32. THE RAIN TREE

(*Fig. 24*)

Enterolobium saman Prain. (Syn. *Pithecolobium saman* or Samanea *saman* Merril.)

Family : LEGUMINOSAE (MIMOSOIDEAE)

Common Indian names: Hindi & Bengali—*belaiti siris*;
Malayalam—*plavu*;
Tamil—*amaivagai*.

Samanea is a corruption of a native Spanish name of *Zaman*.

Distribution : Native of Central America and the West Indies; is common in tropical India, particularly in Bengal.

Description : A large, handsome tree with a spreading crown, forming a canopy of evergreen feathery foliage; bark is coarse.

The leaves are pinnate, long, heavy, having no stalks and becoming larger and more curved towards the end and change their position along with the changing atmospheric condition. In full sunshine, they spread horizontally, allowing practically no penetration of sunlight through the thick canopy. But at night, and during dull or rainy weather, they fold and lie sideways. The name Rain Tree is from the presence of moisture on the ground under the tree, which is largely the discharge of cicadas feeding on the leaves.

Pale-pink flowers appear in large clusterd panicles at the ends of the branches and look like silken tufts. The flowering time is from March till September.

The fruit is a fleshy p od, indehiscent, and sweet to taste; liked much by squirrels, etc.

It is planted as an avenue tree in Bengal, being resistant to winds and its ability to keep its symmetrical shape in spite of wind hazards. The sweet pulp of pods is readily eaten by cattle and horses. Seeds are

FIG. 24. RAIN TREE *(Enterolobium saman)*

generally undigestible. The pods fed to cows are believed to increase the quantity of milk.

Recommended only for tropical States of India. In the northern States, it is liable to be killed by frost during winter. Not suitable for planting in the compounds of houses on account of its large size. An excellent shade-tree for highways.

Gardening notes : It is easily propagated by seed sown in rains. Can also be propagated by cutting. Growth is very rapid.

33. THE RUSTY SHIELD-BEARER OR THE COPPER POD

(*Fig. 25*)

Peltophorum inerme (Llanos. (Syn. *P. ferrugineum* Benth. or *Caesalpinia inermis; P. roxburghii* [G. Dou] Degeher.)

Family : LEGUMINOSAE (CAESALPINIODEAR)

Common Indian names: Tamil—*ivalvagai, iyalvgai, iya vakai, perungondrai;*
Telugu—*kondachinta.*

Peltophorum in Greek means shield-bearing, referring to the shape of the pods and *inerme* is derived from the Latin *inermis*, meaning unarmed; *ferrugineum* describes their rusty colour. *Roxburghii* is after William Roxburgh (1751-1815), Superintendent of the Botanic Gardens, Calcutta.

Copper pod refers to the beautiful copper-coloured fruit pods.

Distribution : A native of Ceylon, it is found commonly in Bihar, Bengal and the Western Ghats.

Description : A partially deciduous tree with a smooth grey bark, dark handsome foliage and a fairly spreading crown.

A large feathery or fern-like leaves are bipinnate. The tree is leafless in January and the young leaves grow in February when it becomes covered with a profusion of bright golden-yellow flowers. It blooms twice in the year, March to May and September to November.

The flowers are mildly fragrant and are arranged in large panicles at the ends of the branches. The blossóms last for a short time and daily carpet the ground.

Fruits are large copper pods and conspicuously hang on the tree during the leafless period, staying on till the next spring when they become black and brittle.

It is a highly ornamental tree, very effective for planting in parks, gardens and avenues. When planted, alternating with *gul mohur*, its

strong nerves radiating from the base. The leaf is split down in the middle, giving a hoof-like appearance. This character makes *Bauhinia* easily recognizable.

The buds are five-angled, dark-green or brown and downy. On opening, the calyx splits into two reflexed segments, one having two wings and the other three.

Flowers, as a rule, are deep pink or rosy purple (purple to lilac or red), large and showy, and are five-petalled, clawed or pointed. At times, the base of one petal is white. It flowers profusely in November.

Profuse flowering is followed by long, sword-like green pods, looking like the French beans among the foliage.

The bark is used for dyeing and tanning and sometimes for fibre also. The flowers are pickled or used as vegetable. The bark of the underground root is poisonous. The wood is used for agricultural implements and for building.

The tree is mainly used for ornamental planting and is admirably suited for small gardens and road-side avenues.

Gardening notes : It is easily grown from seed. The seeds are sown in lines in the beginning of the monsoons. The seedlings appear in about 4 to 10 days and are transplanted during rains. The branches which lean out are cut off.

It flourishes in high well-drained soil. It is easily affected by low temperatures. It is a beautiful tree which deserves greater popularity on account of the fact that it is one of the few trees which flower in winter.

26. THE KACHNAR OR VARIEGATED BAUHINIA

(Plate VI)

Bauhinia variegata Linn.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Hindi—*kachnar* (baisakhi);
Bengali—*bidul, kovidara*;
Kannada—*arisinantigi*;
Malayalam—*kovidaiam*;
Marathi—*kanchan*;
Oriya—*boroda*;
Tamil—*mandarai*;
Telugu—*bodanta*.

For *Bauhinia*, see under *B. purpurea*. *Variegata refers to the variegated flowers.*

Distribution : Indigenous to India, it is found throughout the country. Common in the sub-Himalayan tracts from the Indus towards Assam, Chota Nagpur, Madhya Pradesh and western Peninsula. Very common in the Kangra Valley, where it is grown in every village.

Description : It is a small tree with openly branched irregular crown with brown and slightly rough bark.

Leaves split down the middle, with 11-15 strong nerves, radiating from the top of the stalk. Leaves fall in February when the tree is bare.

The specimens are specially attractive for their gnarled trunks and are clothed in a rough bark, which gives an appearance of great age, though they rarely live beyond 60 or 70 years.

Flowers are large, white with light-yellow spots on pink with red spots, or purple-mauve and are orchid-like in shape. They appear when the tree is in a leafless condition from February to March. The trees when in bloom present a beautiful sight.

PLATE V The Pink Cassia (*Cassia Javanica*)

The flower buds are popular as a vegetable. The timber is hard and is used for fuel and for making agricultural implements. The bark is used medicinally and the trees are often seen damaged due to its removal. The bark is used for tanning and dyeing. Leaves are used as wrappers for *bidis*. The tree also yields a gum, possessing properties similar to those of the cherry gum. The seeds yield an oil.

The pods are long and narrow and contain 10 to 25 seeds.

It is a very beautiful tree and an avenue of pink, white and purple varieties presents a heavenly sight.

Gardening notes : Commonly propagated from seed. It is fast-growing in early stages, and attains a height of six to eight feet in the first season of its planting and flowers during the second year. Cuttings root with difficulty. An excellent tree for parks and open places.

Another variety, *B. triandra* Roxb., commonly known as Pink Bauhinia or *lal kachnar* R. in Hindi, is a small bushy tree, with pinkish flowers and is in bloom from October to November.

PLATE VI The Kachnar or Variegated Bauhinia (*Bauhinia variegata*)

27. THE INDIAN LABURNUM OR AMALTAS

(Plate VII)

Cassia fistula Linn.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Other popular names : Golden Shower, Pudding Pipe Tree.

Common Indian names : Hindi—*amaltas*;
Bengali—*bandarlati, amultas, sondal*;
Kannada—*kakke*;
Malayalam—*bahava, bhava*;
Oriya—*sandari*;
Punjabi—*alash*;
Tamil—*appai, konnai, tiru kontai*;
Telugu—*relu, aragvadhamu.*

Cassia is the old Greek name of Dioscorides (probably a classic name of a tree with aromatic bark, perhaps of a species of wild cinnamon); and *fistula* in Latin means pipe, referring to the shape of the pod.

Distribution : Native of India, it is found throughout the deciduous forests and plains of the country, ascending to the foothills of the Himalayas. Also found in Burma, Java, Viet Nam and the Philippines.

Description : It is a small-to medium-sized open-branched, deciduous and hardy tree with smooth greenish-grey bark on young trees, turning to brown and rough in older trees.

Leaves are large and coarsely pinnate. The fresh leaves are often of a rich copper colour with a soft downy undersurface, and remain

pendulous and folded until fully grown. Leaves fall in March-April and the first half of May.

Amaltas is most conspicuous in the hot weather due to long golden-yellow pendent flowers which appear in April-May. It is nearly leafless at the time of flowering, the first splashes of gold appearing as the last of the old leaves are shedding, and the flowering continues till the new leaves develop.

Fruit pods are long and rounded, 1-2 ft in length and ¾ inch in diameter, and are dark-brown.

The wood is hard and is used in making carts and agricultural implements. Bark is used for tanning. The dark-brown sweetish pulp is laxative and is used medicinally. The pulp, in Bengal is also used to flavour tobacco. The Santhals in Bihar use the flowers as food.

It is suitable for parks, gardens and avenues.

Gardening notes : It is commonly propagated from seed. It is advisable to plant more seeds, even though a few plants may be required, for the germination is poor. Germination is hastened by boiling the seeds for five minutes before sowing to soften the hard seedcoat. The seedlings are transferred to baskets in the first rains.

Trees are often defoliated by caterpillars. It is advisable to keep a watch on young trees and remove the caterpillars.

It is a hardy, xerophytic tree, not eaten by goats or cattle. Hence it can be grown in places invaded by cattle. It is suitable for dry districts.

The trees are slow in growth and attain good proportions only after about ten years. Under favourable conditions, the young trees come into bloom after five years of planting.

FIG. 21. WEST INDIAN MOUNTAIN ROSE *(Brownea coccinea)*

PLATE VII The Indian Laburnum or Amaltas (*Cassia fistula*)

28. THE WEST INDIAN MOUNTAIN ROSE

(*Fig. 21*)

Brownea coccinea Loeff. ex. Griseb.

Family : LEGUMINOSAE (CAESALPINIOIDEAE)

Distribution : Native of Venezuela. Specimens can be seen in gardens of West Bengal, Uttar Pradesh, Mysore and Kerala.

Description : It is a small tree, 8 to 10 feet high, of handsome compact growth, with dazzling heads of scarlet flowers scattered in the foliage. However, there is no mass-flowering.

It has two unique features : its leaves and the manner of blooming. The new leaves are first developed within a long pencil-like appendage which suddenly unfolds fully formed leaves which are often bright purple and handsomely mottled. They quickly straighten out into smooth dark-green leaves. The flowers, 30-50 together in six-inch heads, are borne profusely all over the trunk, from the base to the crown, and are rarely seen on the larger limbs.

Gardening notes : It is commonly propagated by layers.

It does well in moist climate and is hence unsuitable for northern India due to hazard of hot winds. It can, however, be grown in sheltered spots. It is suitable for coastal areas of southern or eastern India.

PLATE VIII The Colvilles Glory Tree (*Colvillea racemosa*)

FIG. 22. COLVILLE'S GLORY *(Colvillea racemosa)*

29. THE COLVILLE'S GLORY

(Fig: 22 Plate VIII)

Colvillea racemosa Bojer

Family : LEGUMINOSAE (CAESALPINIODEAE)

Common Indian name : Hindi—*kilbili.*

Colvillea is after Sir Charles Colville, and *racemosa* refers to raceme flowers.

Distribution : Native of East Africa or West Coast of Madagascar. Common in Bangalore as an avenue tree. Also grows in Alfred Park, Allahabad.

Description : A medium-sized tree with umbrella-like habit, resembling *gul mohur* when not in flower. The leaves are pinnate, composed of from 20 to 30 pinnae.

It flowers in July-August to October, orange to red in large drooping racemes at the ends of the branches. They can be compared to bunches of grapes coloured orange-red. Stamens are large and prominent. Flowers appear in a scarlet fringe on the top of the crown and are a glorious sight. The flower buds are very striking in appearance. They are nut-like in form, appearing in large drooping clusters, and diminishing in size while approaching the raceme end.

The fruit is a pod, two-valved and rounded in cross section. It is planted as an ornamental tree in parks and gardens.

Gardening notes : It is propagated from seed. It sets seed in south India. As the flowers are terminal, the tree should not be pruned. It is suited to moist or moderately dry low country.

FIG. 23. MOULMEIN ROSEWOOD *(Milletia ovalifolia)*

30. THE MOULMEIN ROSEWOOD

(*Fig. 23*)

Milletia ovalifolia Kurz.

Family : LEGUMINOSAE (PAPILIONACEAE)

Distribution : It is a small tree with beautiful lilac-coloured flowers, appearing in leafless condition and entirely covering the tree. Its mauve and lilac flowers are a glorious sight in April.

It is suitable for compounds of houses as well as for parks and open places.

Gardening notes : Grown from seed.

31. THE SESBAN OR AGASTYA

Sesbania grandiflora Poir.

Family : LEGUMINOSAE (PAPILIONACEAE)

Sesbania is probably from Arabic S. *aegyptiaca* common to Egypt and *grandiflora* refers to the large and handsome flowers, perhaps the largest of the pea family.

Distribution : From Mauritius, India to North Australia.

Description : A small quick-growing tree with pinnate leaves. Flowers large, pea-shaped, borne-singly or in short racemes in the axils of the leaves. There are two varieties with salmon pink flowers and cream-coloured flowers. The flowering period is in December-January. Flowers of pink variety open at dusk when they are pale greenish white but by the morning turn pink. The flowers are perhaps pollinated by bats which visit them for nectar.

Fruit pods are long and narrow.

Often cultivated in gardens for its showy flowers. Flowers eaten in the form of *pakoras* (a type of snack). Tender leaves and pods are also eaten. Certain parts of the tree are used medicinally.

Gardening notes : It is easily raised from seed in the rains. Yields a fine hedge in a year and flowers in the same year. Also used as a green manure plant.

32. THE RAIN TREE

(*Fig. 24*)

Enterolobium saman Prain. (Syn. *Pithecolobium saman* or Samanea *saman* Merril.)

Family : LEGUMINOSAE (MIMOSOIDEAE)

Common Indian names: Hindi & Bengali—*belaiti siris*;
Malayalam—*plavu*;
Tamil—*amaivagai.*

Samanea is a corruption of a native Spanish name of *Zaman.*

Distribution : Native of Central America and the West Indies; is common in tropical India, particularly in Bengal.

Description : A large, handsome tree with a spreading crown, forming a canopy of evergreen feathery foliage; bark is coarse.

The leaves are pinnate, long, heavy, having no stalks and becoming larger and more curved towards the end and change their position along with the changing atmospheric condition. In full sunshine, they spread horizontally, allowing practically no penetration of sunlight through the thick canopy. But at night, and during dull or rainy weather, they fold and lie sideways. The name Rain Tree is from the presence of moisture on the ground under the tree, which is largely the discharge of cicadas feeding on the leaves.

Pale-pink flowers appear in large clusterd panicles at the ends of the branches and look like silken tufts. The flowering time is from March till September.

The fruit is a fleshy pod, indehiscent, and sweet to taste; liked much by squirrels, etc.

It is planted as an avenue tree in Bengal, being resistant to winds and its ability to keep its symmetrical shape in spite of wind hazards. The sweet pulp of pods is readily eaten by cattle and horses. Seeds are

FIG. 24. RAIN TREE *(Enterolobium saman)*

generally undigestible. The pods fed to cows are believed to increase the quantity of milk.

Recommended only for tropical States of India. In the northern States, it is liable to be killed by frost during winter. Not suitable for planting in the compounds of houses on account of its large size. An excellent shade-tree for highways.

Gardening notes : It is easily propagated by seed sown in rains. Can also be propagated by cutting. Growth is very rapid.

33. THE RUSTY SHIELD-BEARER OR THE COPPER POD

(*Fig. 25*)

Peltophorum inerme (Llanos. (Syn. *P. ferrugineum* Benth. or *Caesalpinia inermis; P. roxburghii* [G. Dou] Degeher.)

Family : LEGUMINOSAE (CAESALPINIODEAR)

Common Indian names: Tamil—*ivalvagai, iyalvgai, iya vakai, perungondrai;*
Telugu—*kondachinta.*

Peltophorum in Greek means shield-bearing, referring to the shape of the pods and *inerme* is derived from the Latin *inermis*, meaning unarmed; *ferrugineum* describes their rusty colour. *Roxburghii* is after William Roxburgh (1751-1815), Superintendent of the Botanic Gardens, Calcutta.

Copper pod refers to the beautiful copper-coloured fruit pods.

Distribution : A native of Ceylon, it is found commonly in Bihar, Bengal and the Western Ghats.

Description : A partially deciduous tree with a smooth grey bark, dark handsome foliage and a fairly spreading crown.

A large feathery or fern-like leaves are bipinnate. The tree is leafless in January and the young leaves grow in February when it becomes covered with a profusion of bright golden-yellow flowers. It blooms twice in the year, March to May and September to November.

The flowers are mildly fragrant and are arranged in large panicles at the ends of the branches. The blossóms last for a short time and daily carpet the ground.

Fruits are large copper pods and conspicuously hang on the tree during the leafless period, staying on till the next spring when they become black and brittle.

It is a highly ornamental tree, very effective for planting in parks, gardens and avenues. When planted, alternating with *gul mohur*, its

FIG. 29. GORAKH-CHINCH *(Adansonia digitata)*

within by a spongy acidic pulp containing many kidney-shaped seeds surrounded by tough fibres.

It is a good foliage tree and is long-lived. The inner bark fibre is used for ropes and cordage. The acidic pulp is edible and refreshing drinks are prepared from it. The fruit is used medicinally or smoothing irritations and curing scurvy. It also relieves stomach disorders. The gourds are used as floats in Gujarat by the fishermen for their nets, and *sadhus* use the dry shells as water-pots. Leaves are also edible. The timber, being spongy, is used for raft-making.

Gardening notes : Commonly propagated from seed. Planted singly in parks.

40. THE MEXICAN SILK COTTON TREE

(*Fig. 30*)

Chorisia speciosa St. Hill.

Family : MALVACEAE (BOMBACACEAE)

Distribution : Commonly grown in Madras and Kerala. A beautiful tree with bottle-shaped green trunk. It is a fast-growing tree which begins flowering in about five years.

Description : It bears numerous light-yellow flowers in a leafless condition in October. Its green stem appears very beautiful.

Gardening notes : Commonly raised from seed, sown in rains. Suitable for moist localities, particularly the coastal area of southern India.

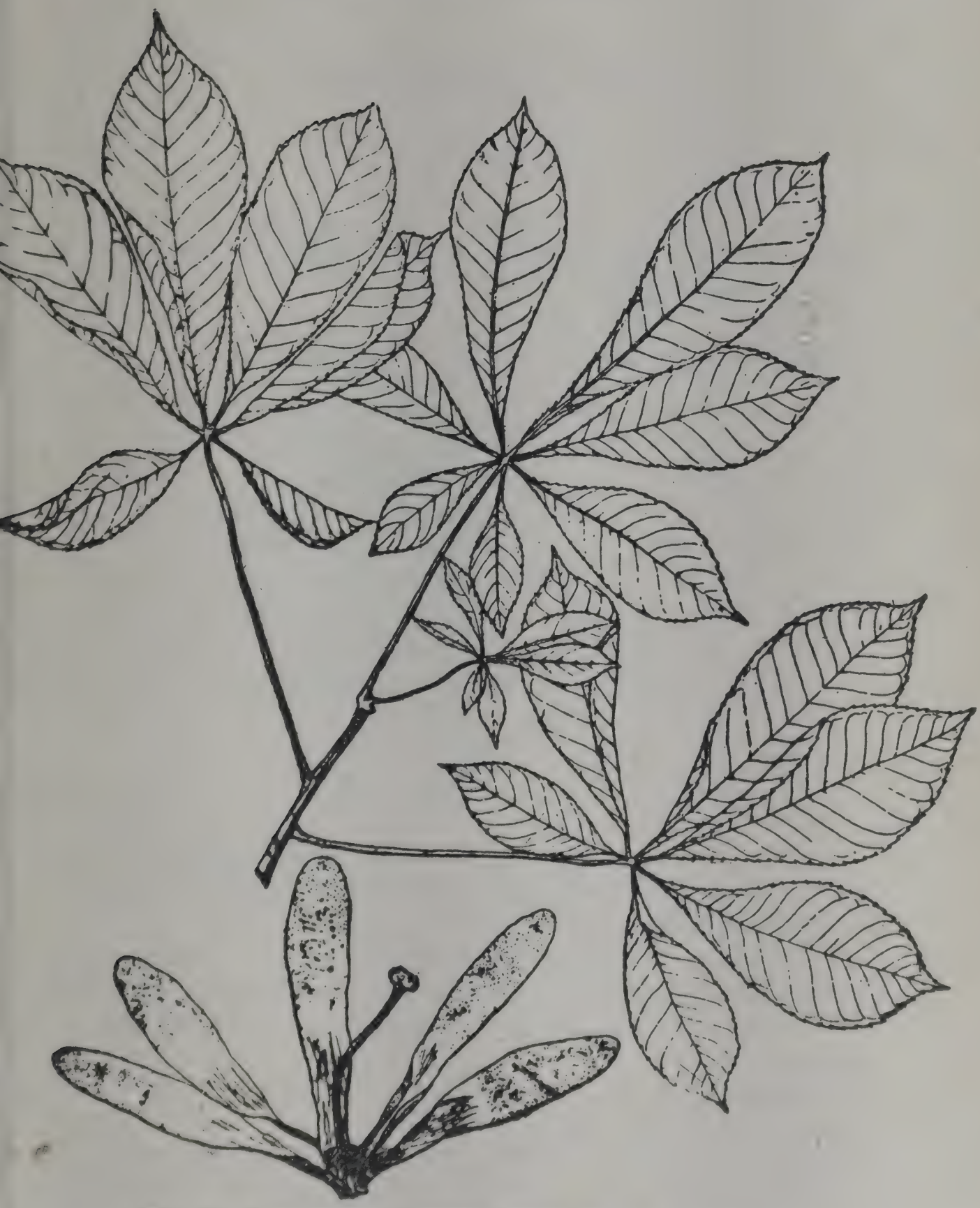


FIG 30. MEXICAN SILK COTTON TREE *(Chorisia speciosa)*

41. THE BHENDI TREE

(*Fig. 31*)

Thespesia populnea Soland ex Correa (Syn. *Hibiscus populneus* Linn).

Family : MALVACEAE

Other popular names : Portia tree, Tulip tree.

Common Indian names
Hindi—*bhendi, pipal;*
Bengali—*dumbla gajashundi, parash, porash;*
Gujarati—*bendi, parasapiplo;*
Kannada—*arasi, huvarsi;*
Malayalam—*chandamaram;*
Marathi—*bendi, ranbhendi;*
Oriya—*gunjausto;*
Punjabi—*pahari pipal, paras-pipal;*
Tamil—*kallal;*
Telugu—*galgaiavi.*

Thespesia is derived from the Greek *thespesios* meaning divine, so named because of its being often planted near churches or temples, and *populnea* refers to its poplar-like leaves.

Distribution : Common in southern States of India, especially in Madras, Mysore and Kerala; also found in Burma, Malaya, Africa and the Pacific Islands. Extensively planted as an avenue tree in Chandigarh.

Description : A large evergreen tree (30 to 40 feet) with crooked stem and poplar-like glossy, dark-green leaves.

Flowers are large, yellow and cinnamon red, bell-shaped, resembling those of the vegetable plant *bhendi*, or cotton plant. They

FIG. 31. BHENDI TREE *(Thespesia populnea)*

appear singly, off and on, throughout the year. Peak flowering is in cold weather.

The fruit is a capsule, somewhat rounded and flattened at the top. Pods are filled with white papery seeds.

It is a shady road-side tree and is also suitable for medium-sized gardens.

Its bark yields a strong fibre. Its wood is tough, with fine grains, and is used for making gun-stocks and cart wheels. Leaves are used for wrapping food. Seeds yield a thick oil. Its fruit juice is used for external application to cure cutaneous diseases. Its root is taken as a tonic. In Malaya, the deep-red heartwood is said to be used as a remedy in heart attacks.

Gardening notes : It is easily raised from seed or from cuttings. Growth is rapid.

It prefers a light porous soil and is extremely salt-resistant. Hence it is very suitable for saline soils. It is oneof the rare trees which flower all the year round, and is also shady. It deserves greater popularity. On account of its hardy nature, it can grow in all the States in India, excepting the hills.

42. THE MAGNOLIA

(*Fig. 32*)

Magnolia stellata, Maxim. (Syn. *M.* Hort.)

Family : MAGNOLIACEAE

Other popular name : Champa.

It is a hardy shrub or a small tree with spreading branches. The leaves are 2-5 inches long, elliptic or obovate to oblong-obovate, obtusely pointed, and the young leaves are pubescent underneath.

FIG. 32. MAGNOLIA *(Magnolia stellata)*

The tree is very free-flowering and begins to flower when hardly 2 ft high. Flowers are numerous, white, short-stalked and sweet-scented. Petals are narrowly oblong, 9-8, spreading and reflexed.

The fruit contains only a few fertile carpels.

43. THE NEEM

(*Fig. 33*)

Azadirachta indica A. Juss. or *Melia indica* Linn.

Family : MELIACEAE

Other popular name : Margosa.

Common Indian names : Hindi & Bengali—*neem, nim;*
Gujarati—*timba;*
Kannada—*bevu;*
Malayalam—*vepe;*
Marathi—*nimbay, limba;*
Punjabi—*neem;*
Tamil—*vepa;*
Telugu—*yepa, vempu.*

Azadirachta is from the Persian *Melia azedarach*, to which the *neem* is allied. *Indica* means "Indian".

Distribution : Native of India, it is found throughout the dry area of the country.

Description : It is a medium-sized or large tree with a straight trunk, elegant in form and evergreen, though deciduous in certain climates.

Leaves are compound, long and pendent, crowded at the ends of branches. Young leaves are pale, tender, green and tinted with rust. Their fresh green colour and shining surface give the tree a charming appearance. The leafless period is in March but is quite brief.

Flowers are small, white and sweet-scented. Blossom in the first week of April. The fruits stink badly after a shower. Owing to its large leaf area, its photosynthetic rate is high and it gives out more oxygen than most trees. Hence it is considered a good purifier of air. Sometimes the sap oozes from the stem in the hot months. This

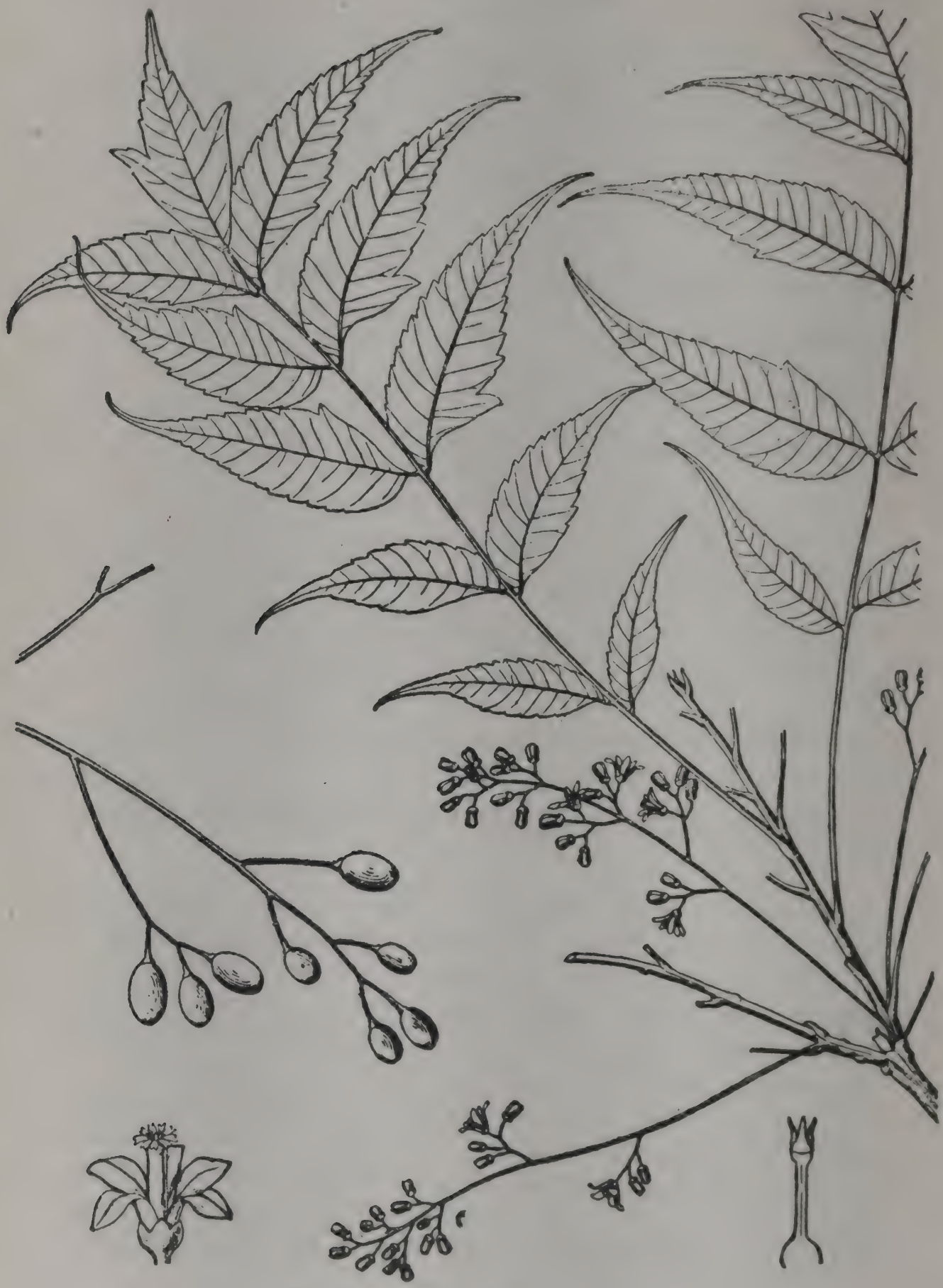


FIG. 33. NEEM *(Azadirachta indica)*

phenomenon is called 'weeping'. When the tree is weeping, sap can be collected and stored.

Fruits are yellow berries (one-seeded—drupe) about an inch long. An excellent shade-tree for avenues and parks. All the parts of the tree find various uses. The tree yields an amber-coloured gum which is used medicinally. The seeds yield the famous *Margosa* oil of disagreeable garlic-like flavour known to be effective in the treatment of leprosy and skin diseases, besides being useful in the manufacture of soap. It is used as a cure for mange in dogs. The oilcake is regarded as a useful fertilizer. *Neem* cake is also effective in reducing the incidence of citrus canker and citrus leaf-miner. The wood is also used for various purposes. Dried leaves, when put in clothes, drawers and cupboards, can ward off insects. Leaves in poultice form are used for the healing of wounds. Green twigs are used as tooth brushes for cleaning the teeth. Leaves are also used as a vegetable in Bengal.

Gardening notes : It is a hardy tree and stands pollarding, salinity and drought conditions well. If it grows too big, its crown is cut off from the top of the stem in December-January. New shoots will sprout in March.

It is propagated from seed. The seed does not keep long and hence should be sown immediately after collection.

44. THE PERSIAN LILAC OR THE BEAD TREE

(*Fig. 34*)

Melia azedarach Linn.

Family : MELIACEAE

Common Indian names Hindi—*dake, drek, bakain;*
Bengali—*mahanim;*
Malayalam—*vaymbu;*
Marathi—*pejri;*
Tamil—*mallay vembu, puvempu;*
Telugu—*tarka vepa.*

Melia is from the Greek name of the tree, meaning ash, though this tree does not resemble an ash and *azedarach* is from the Persian name of this species *azad-darakht*, meaning an independent tree.

Distribution : Native of the sub-Himalayan and Siwalik tracts of India; also common in Burma, China and Persia. Grows wild in Baluchistan. It is common in the Punjab, especially around irrigation wells fitted with Persian wheels. Deserves greater popularity in other States of India.

Description : It is a medium-sized (15-25 feet), deciduous and very fast-growing tree. It has smooth dark-grey or brown bark, cracked vertically in long fissures, and has a spreading crown. The tree is somewhat similar in appearance to the *neem.*

Leaves are beautiful and fern-like, compound, sub-divided at the base into several pinnae, bearing 5-7 leaflets. They turn yellow and fall in December-January. New leaves appear in March along with flowers.

Numerous soft lavender-coloured and scented flowers are borne in bunches during spring, i.e. March-April. They are followed by rounded fruits which are drupaceous and ripen in the cold weather.

FIG. 34. PERSIAN LILAC *(Melia aezdarach)*

They hang on the tree in yellow clusters till the next flowering season and even sometimes later. Fruits are smooth first but wrinkled afterwards. Each fruit contains five seeds, each having a natural perforation through the centre which makes them ideal for being used as beads.

Poisonous fruits yield a medicinal oil. The leaves and flowers are used as poultice and are said to cure the eruptions of the scalp as well. Stones of fruits are used for necklaces and rosaries. The root is said to be used as anthelmintic.

The tree is cultivated mainly for its ornamental and shade value. On account of its quick growth, it is ideal for places where shade is required. It is not suitable for avenues, being shallow-rooted and is easily blown off by strong winds.

Gardening notes : Grown from seed in rains. The seeds should be sown as soon as ripe, for the old seeds have poor viability. It is a fast-growing tree, attaining a height of 8 to 10 feet within a year or fifteen months. Saplings are tender to frost, but are more resistant than the *neem*. It is not attacked by rats or white ants on account of its bitter bark.

45. THE DRUMSTICK TREE OR HORSE-RADISH TREE

(Fig. 35)

Moringa oleifera Lam. (Syn. *M. Pterygosperma* Lam. and Gaertn.)

Family : MORINGACEAE

Common Indian names: Hindi & Bengali—*soanjana, sainjan, suhunjna, sohanjna;*
Malayalam—*sakhta, shakta;*
Tamil—*morunga;*
Telugu—*munga.*

Moringa is after the Tamil name for this tree and *oleifera* in Latin means oil-bearing. *Pterygosperma* is a Greek word, meaning winged seeds.

Distribution : Indigenous to the western Himalayas and Oudh. Very common throughout India.

Description : A fair sized elegant-looking deciduous tree with rough and corky bark.

The leaves are fern like, divided and sub-divided. The tree is leafless for a short time before it flowers in February to April.

Creamy white and honey scented flowers are borne in large loose clusters which appear along with the leaves.

The fruit is pod like, 3 angular and pendulous, containing many winged seeds. The pods ripen about three months after flowering and are eaten as a vegetable.

It is a much-valued tree for its graceful appearance due to much-divided leaves. The leaves, flowers and young pods are eaten as a vegetable. Oil (commonly termed as Ben oil) and fibre are also extracted. The tree yields a gum similar to Tragacanth. Young roots serve as a substitute for horse-radish.

FIG. 35. HORSE-RADISH TREES (*Moringa oleifera*)

Gardening notes : Grows easily from seed and cuttings.

It is fast-growing and the young plants are hardy and easy to handle. For providing quick shade, it is an excellent tree.

Seeds are sown in July. This tree stands pollarding very well and new shoots appear very quickly.

FIG 36. SCARLET BOTTLE BRUSH *(Callistemon lanceolatus)*

46. THE SCARLET BOTTLE BRUSH TREE

(*Fig. 36*)

Callistemon lanceolatus Sweet.

Family : MYRTACEAE

Common Indian name : Lal botal brush.

Distribution : A common garden tree in the Punjab and Uttar Pradesh.

Description : A very handsome evergreen tree, with pendulous branches resembling the weeping willow with clusters of small leaves.

Scarlet flowers appear in bottle-brush-like tufts in March. It flowers again in October. It owes its beauty to the massed red-coloured stamens where the filaments project in every direction all around the branches near their tip ends.

Its graceful 'weeping habit' makes it suitable for avenue planting and the flowering is an attractive feature of the tree's life.

This tree has an interesting growth habit. At the end of the flowering season when the stamens have dropped, the basis from which they arose become pods which are filled with fine seeds. Eventually the pod dehisces and the seeds drop out and may germinate in a swampy place. The flowering branch in the meantime continues to grow beyond that point, bearing the next blooms almost at the tip of the branch, leaving behind the seed pods on the last year's growth of the same branch.

Gardening notes : Commonly propagated from seed.

47. THE CANNON-BALL TREE

(*Fig. 37*)

Couroupita guianensis.

Family : MYRTACEAE

Common Indian name : Tope gola R.

Distribution : Native of tropical South America, it is found in moist tropical India; also found in Ceylon. Excellent specimens of this tree can be seen in Victoria Garden, Bombay, and in Bangalore.

Description : A remarkable tree with large pink and white fleshy flowers, yellow outside, folded strangely and borne on the main stem. The tree has untidy branches.

FIG. 37. THE CANNON-BALL TREE

Its brown fruit pods are globular, about the size of a man's head, resembling a cannon-ball. The fruit requires more than a year to ripen and the seeds inside are imbedded in a stinking pulp.

Inhabitants of Guiana use the fruits as feed for barnyard animals. The jungle monkeys also relish it.

The strange feature of this tree is the habit of dropping all the leaves suddenly several times during the year and putting on new ones within a period of seven to ten days. The flowers hang from the main stem, looking like mouse-traps and have a curious type of smell. The strings of flowers, all the way from the ground to the crown, present a column of red against the grey bark of the trunk. Dark-

green leaves appear in clusters at the tips of branches.

Gardening notes : Propagated mostly from seed. It flourishes only in moist tropical climates. As a curiosity it deserves to be planted in public parks and gardens.

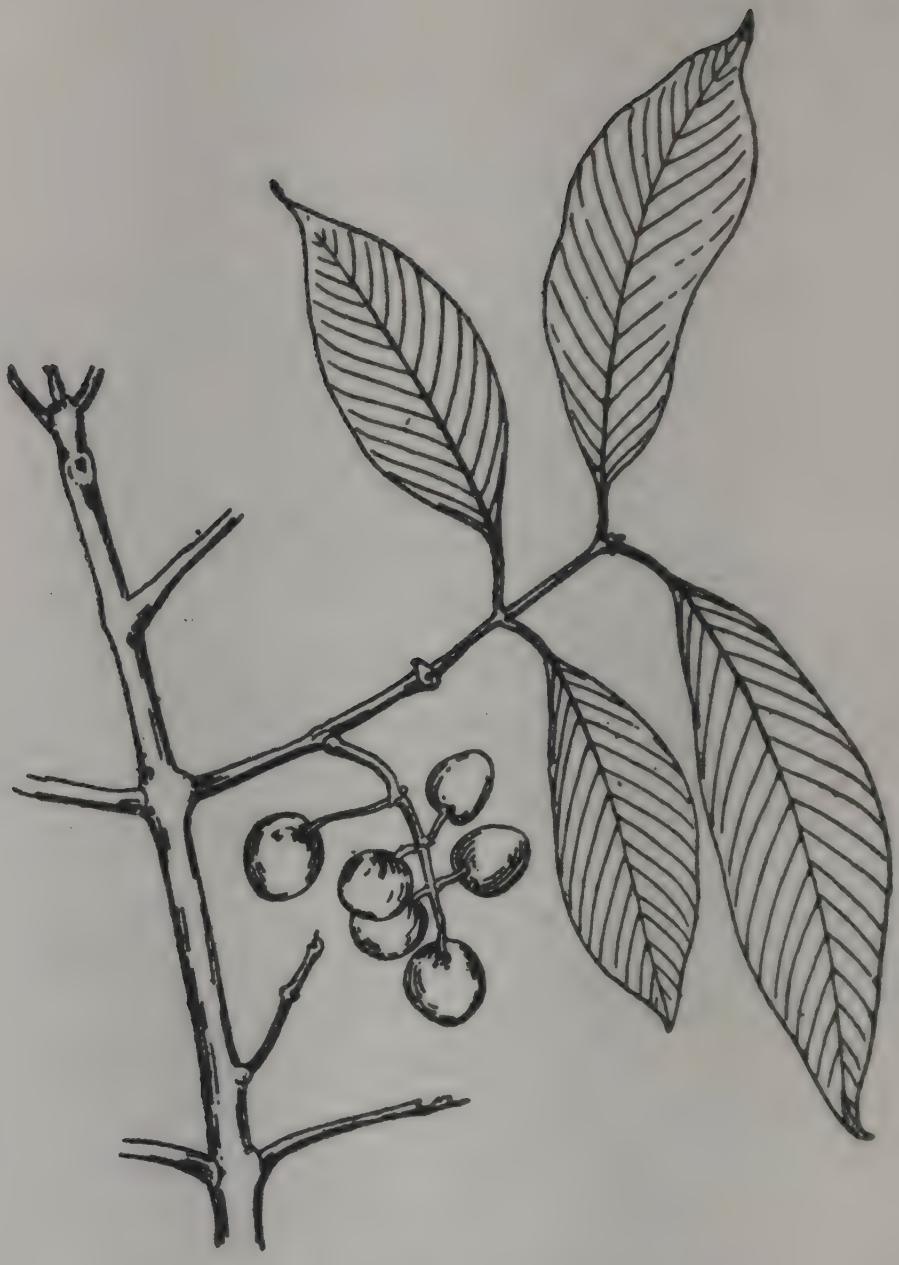


FIG. 38. JAMOA (*Eugenia cuspidata*)

48. THE JAMOAH OR JAMOA

(*Fig. 38*)

Eugenia cuspidata Berg.

Family : MYRTACEA

Common Indian name : Jamoah.

Eugenia is after Prince Eugene of Savoy, an enthusiast of botany in the seventeenth century.

Distribution : Common in the north. Grown extensively as a road-side avenue tree in New Delhi.

Description : A medium-sized evergreen tree with spreading branches and shady crown of bright-green leaves and light yellow stem. The tree renews its leaves imperceptibly in the month of March, and the new leaves have an attractive light-green colour.

Fruits are sour and of small size, having less pulp than the *Jambolana* and ripen in July-August.

A very desirable avenue tree for town roads and is particularly effective when grown alternating with deciduous flowering trees like *kachnar, amaltas* and *jacaranda.* When alternated with various varieties of *Bauhinia variegata,* it looks very pretty. The wood is brittle.

Gardening notes : Grown easily from seed. The growth is slow and the saplings are sensitive to frost. The tree coppices well and the coppice shoots are comparatively rapid in growing.

49. THE JAMUN OR JAMAN

(*Fig. 39*)

Eugenia jambolana Lam. (Syn. Syzygium cumini.)

Family : MRYTACEAE

Other popular names : Java Plum or Indian Allspice or Jambhool.

Common Indian names : Hindi—*jaman or jamun;*
Bengali—*kalajam;*
Marathi—*jambhul;*
Tamil—*naval;*
Telugu—*neredu.*

Eugenia is after Prince Eugene of Savoy, an enthusiast of botany in the seventeenth century and *jambolana* is from the Portuguese name of the tree. *Syzygium* from the Greek word *suzugos* means paired.

Distribution : Common all over India (except the dry regions), Burma, Ceylon and Malaya. In southern India it grows in forest districts up to an elevation of 6,000 feet. The tree is held in veneration by the Buddhists. Often planted near temples.

Description : It is a large evergreen tree with a dark stem and shining green foliage with a dense crown. The bark is smooth, light or dark-grey to brown.

Leaves are leathery and opposite, having characteristic vein pattern with translucent dots visible against light. Trees shed their leaves during January-February.

Flowers dirty-white, fragrant, crowded in short racemes, arising below the leaves, rarely in the axils of the leaves. The blooming period is from March to May.

The tree fruits in June-July. Fruits are purplish black, smooth and

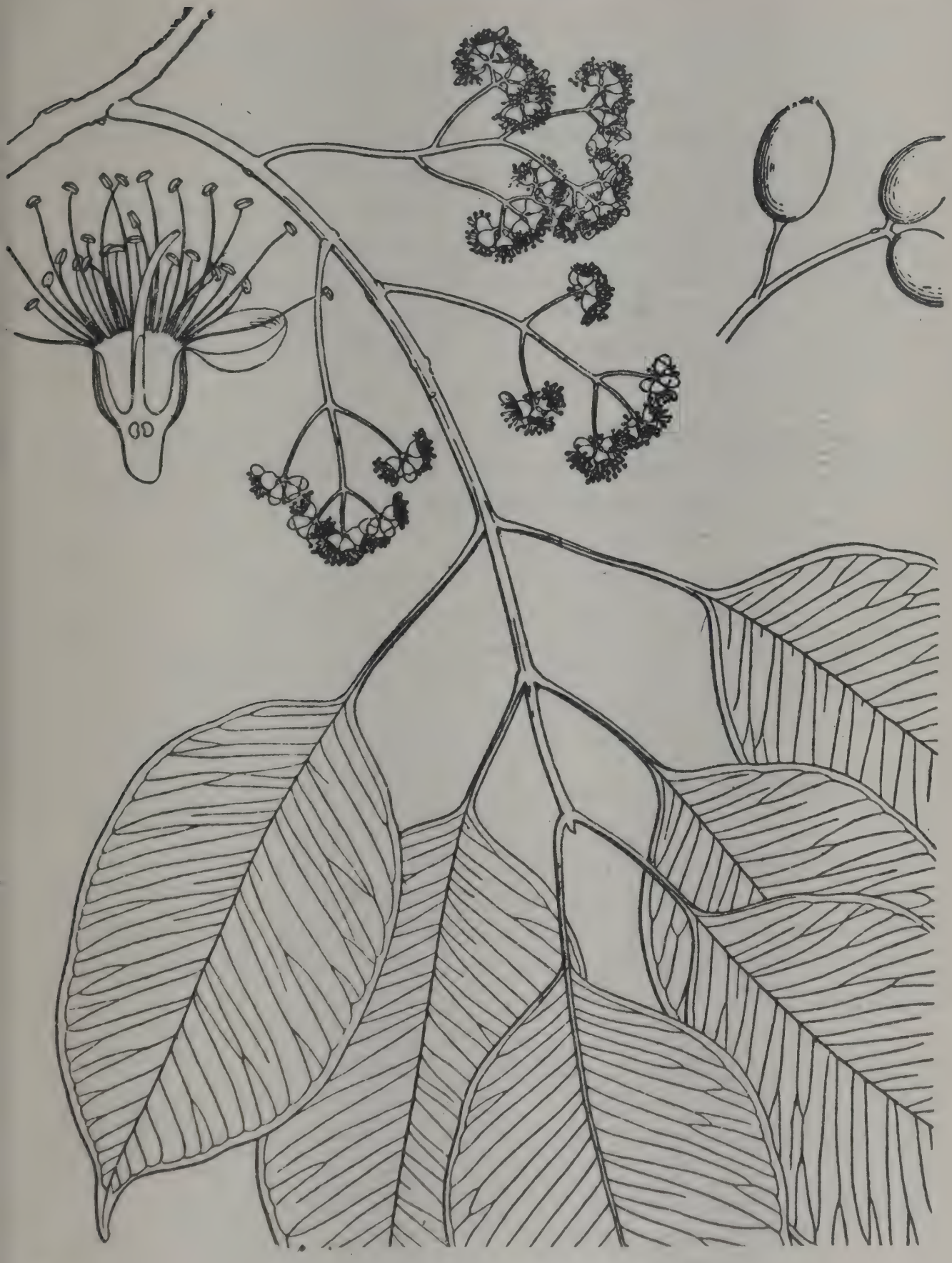


FIG. 39. JAMUN *(Eugenia jambolana)*

shining when ripe and are succulent. Somewhat astringent in taste.

Mainly used as a shade-tree for parks and for fruit. Not good as an avenue tree in inhabited areas for the fruits are eagerly sought by urchins who destroy its branches. The wood is hard and durable and is used as fuel and for making agricultural implements. The bark is astringent and is used in the form of decoction for mouth wash and gargle. Fresh bark juice mixed with goat's milk is used to cure the diarrohoea of children. Leaves are used as fodder and on distillation give a bright-green oil. Its seed is a good remedy for diabetes. Its fruit is also used in the preparation of wine and vinegar. *Tasar* silkworms are also fed on these trees.

Gardening notes : Grown commonly from seed during rains. Its growth is slow initially but is fairly rapid subsequently. Young trees are tender to frost, but become hardy with age.

50. THE KADAMBA

(Plate XIII)

Anthocephalus cadamba Miq. (Syn. *A. indicus* A Rich. *Nauclea Cadamba* Roxb.)

Family : RUBIACEAE

Other popular name : *Kadam.*

Common Indian names : Sanskrit, Hindi, Bengali, Gujarati and Marathi—*kadamba;*
Kannada—*kadawala;*
Malayalam—*attutek;*
Tamil—*cadamba, vellai;*
Telugu—*kadambamu.*

Distribution : Indigenous to the hotter parts of India. Distributed in the sub-Himalayan tract from Nepal eastwards to Burma, and in the south in the Northern Circars and the Western Ghats.

Description : The tree is associated with Sri Krishna. About 2,000 years ago, vast forests of *kadamba* trees were reported to be in existence in the region of Vrindaban, between Mathura and Bharatpur, remnants of which can still be seen in this region.

It is a large graceful deciduous tree with a straight stem about 30 feet and with a girth 5-7 ft. The spreading crown bears drooping branches and yellow ball-like flowers in globose heads amongst a garniture of shiny broad leaves.

The leaves are 5-9 inches long, elliptic oblong or ovate, acute or acuminate, shining and glabrous above and pubescent underneath.

Flower heads are solitary, terminal and globose with peduncles 1 to 1½ inches long. The calyx lobes are oblong, pale greenish or cream-coloured and persistent. The corolla is glabrous and orange-coloured. The flowers appear from June to August in the rainy season.

The false fruits (pseudocarps) are large, fleshy, 2-2½ inches in diameter, and orange-coloured. The fruit ripens towards the end of rains. The fruits are acidic but pleasantly flavoured and cherished by various animals, including flying foxes which also help to disseminate its minute seeds.

The tree is admired for its golden balls of flowers and for their delicate scent. In the rainy season, women decorate their coiffure with *kadamba* flowers. When planted in large groves, the flowers create a beautiful effect. It is chiefly used for packing cases, tea boxes, beams and rafters and is also suitable for dugouts, canoes, carving and turnery. It is also considered suitable for cheap paper-making. Foliage is lopped for fodder.

Gardening notes : The tree is commonly grown in moist deciduous forests and thrives best in well-drained soil. It grows rapidly in the first 6-8 years and attains the maximum size in about 20 years.

51. THE MAHUA OR INDIAN BUTTER TREE

(*Fig. 40*)

Madhuka latifolia (Syn. *Bassia latifolia.*)

Family : SAPOTACEAE

Common Indian names : Hindi, Bengali & Marathi—*mohwa, mahua;*
Malayalam—*illupa;*
Tamil—*kat-illipi, illupai;*
Telugu—*ippa.*

Bassia is after Fernando Bassia, curator of the Botanical Gardens at Bologna in Italy and *latifolia* means broad-leaved.

Distribution : Common in central India, Uttar Pradesh and the sub-mountain Himalayan region, extending from the Ravi to Kumaon. Along with the mango, it dots the entire countryside of Uttar Pradesh.

Description : It is a large deciduous tree with wrinkled bark which may be of grey or brown shade.

Leaves are leathery and clustered near the ends of the branches. Young leaves are coppery red, and are a beautiful sight in February-March.

Flowers are cream-coloured, half-inch across, with plum-coloured calyces. They appear from February to April when the tree is almost leafless. The tree blooms at night and flowers fall to the ground at dawn.

The fruit is a green juicy berry, ripening in June-July and is edible.

Mahua is a forest tree, which is also cultivated for its nutritious flowers which are the staple food of the farmers of Uttar Pradesh and the forest-dwellers of central India. Its virtues are celebrated in numerous folk-songs from central and eastern India.

The flowers are eaten raw or cooked or made into sweetmeats.

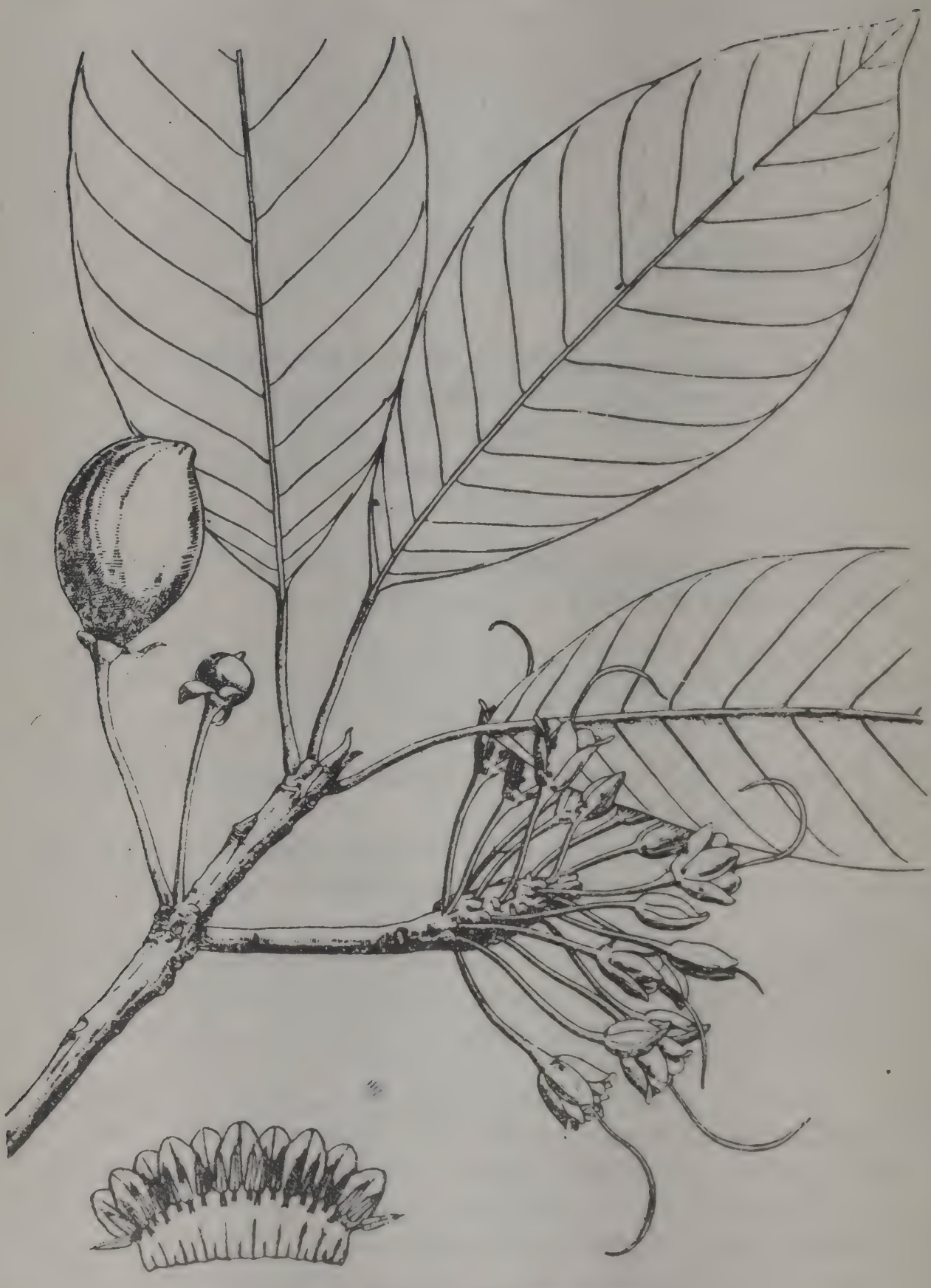


FIG. 40. MAHUA *(Madhuka latifolia)*

Sometimes they are also fermented and distilled for spirit. Seeds on crushing yield oil which is used as a substitute for *ghee*, hence the name Butter Tree. Mahua oil is also used for illumination. Mahua cake is used as manure. It is also used for expelling earth-worms from tennis courts. The bark is used as a dye. Its milky sap from cut flowers, stems and branchlets is used as a cure for rheumatism.

Gardening notes : Commonly grown from seed. Seedlings do not stand transplanting well and hence are transplanted when big enough. Young seedlings being slow in growth require protection from frost.

It is an excellent tree for avenues where shade is required.

FIG. 41. PILKHAN (*Ficus infectoria*)

52. THE PAKUR OR PILKHAN

(*Fig. 41*)

Ficus infectoria Roxb.

Family : URTICACEAE

Ficus is the Latin name for fig.

Distribution : Extensively planted in Uttar Pradesh and New Delhi. Suitable for moist areas.

Description : A large spreading evergreen low-crowned thick shady tree, 35 to 40 feet high with greenish-grey smooth bark, sending down aerial roots. In April it is covered with delicately tinted copper-coloured foliage.

Leaves are alternate, narrow, abruptly acuminate.

When ripe, its fruit is white.

The wood is grey and moderately hard but not very durable.

Gardening notes : Propagated from seed down in nursery stock or from stumps. Branch cuttings produce trees with a low spreading crown, and an ugly stem. Hence it is desirable to propagate this tree from seed. Suitable as an avenue tree where shade is required.

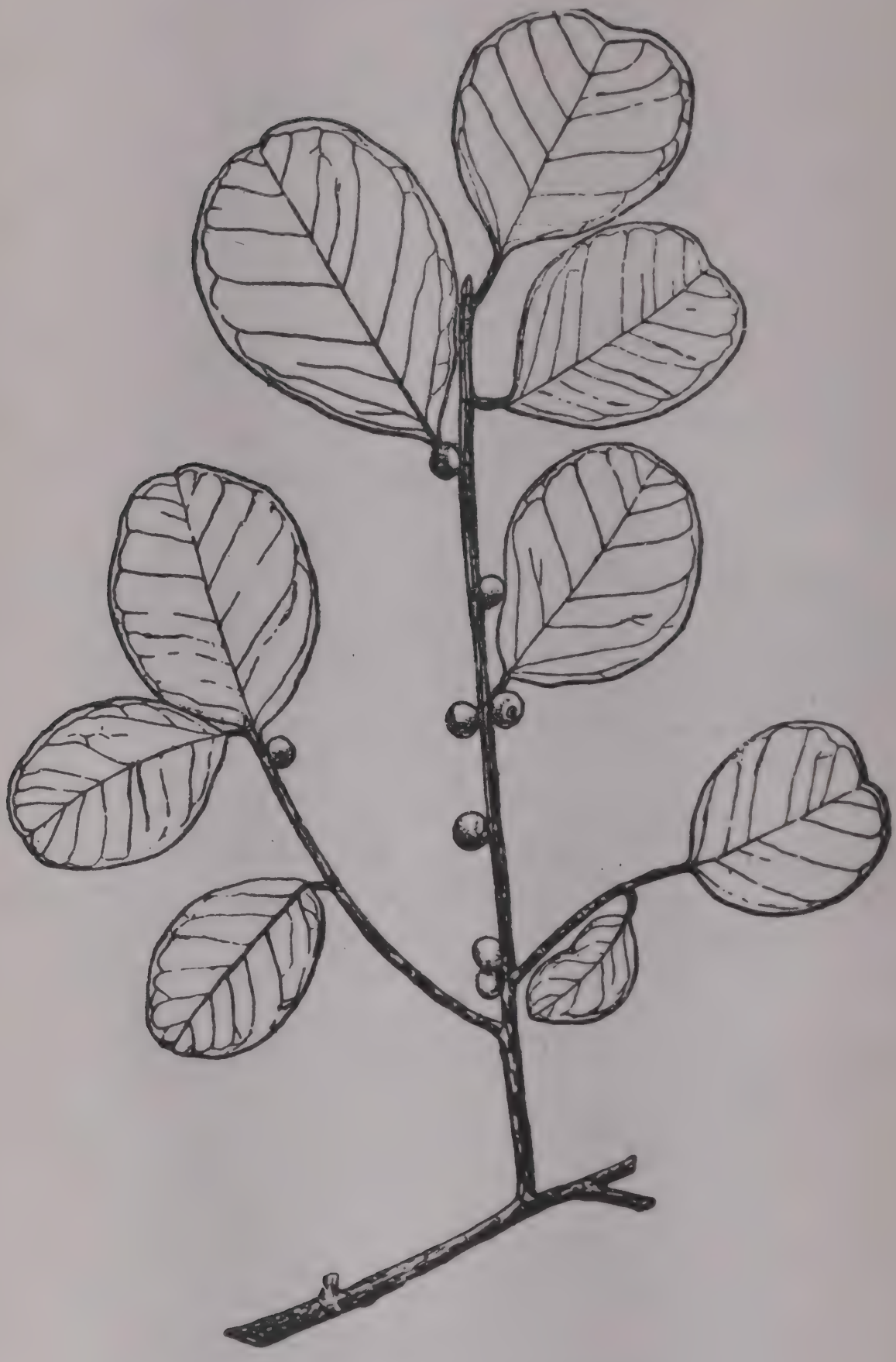


FIG. 42. CHILKHAN *(Ficus retusa)*

53. FICUS RETUSA

(*Fig. 42*)

Ficus retusa Linn.

Family : URTICACEAE

Common Indian name : Chilkhan R.

Distribution : Common in New Delhi.

Description : A large spreading evergreen tree with glossy bark and green leaves. It grows 30 to 35 ft high and is as large as a banyan tree. Leaves are alternate. Flowers from February to April. Fruits are in axillary pairs, yellowish when ripe.

Evergreen and umbrageous, it makes an excellent avenue shade-tree for a wide street. The wood is light reddish-grey, moderately hard and prettily mottled, used mostly as fuel.

Another good shady *Ficus* species is *F. tsiela* Roxb., found in Maharashtra and locally known as 'piperi' or 'piper', bears sessile fruits in pairs and crowded at the ends of tender branches.

FIG. 43. KRISHNA'S BUTTER CUP *(Ficus krishnae)*

54. KRISHNA'S BUTTER CUP

(Fig. 43)

Ficus krishnae

Family : URTICACEAE

Common Indian name : Makhan katori R.

Distribution : Grown in gardens in northern India.

Description : A small tree with folded leaves joined at the base which appear like containers of ice-cream (*kulphis*). The legend is that Krishna used to store butter in the leaves.

Gardening notes : Propagated from seed. As a curiosity, it should be grown in all public parks and gardens.

FIG. 44. TREE OF LIFE *(Guaiacum officinale)*

55. THE LIGNUM VITAE

(*Fig. 44*)

Guaiacum officinale Linn.

Family : ZYGOPHYLLACEAE

Other popular names : Tree of Life, Gum Guaiacum

The Latin name *Guaiacum* is derived from the Mexican name *hoaxacaa* and *officinale* means what is recognized in pharmacy or medicine.

Linnum vitae means the tree of life and is the name of the timber. It is also called Brazilwood.

Distribution : Native of West Indies. Good specimens can be seen in Bombay, Madras, Bangalore and Hyderabad.

Description : A shrubby evergreen tree, with a crooked trunk and with deeply furrowed bark.

The leaves are compound, small and dark-green. Each leaf is composed of 2 or 3 pairs of smooth, stalkless leaflets on a slender mid-rib.

The flowers are borne in clusters of bright blue in great profusion in March and November. The colour of the flower fades from deep blue to light blue. The variegated pattern of colour produces a beautiful contrast with the dark-green leaves.

The fruit is an irregular capsule, flattened, at first green, but turning yellow on ripening.

The bark yields a resin which is used medicinally. The wood is heavy and hard, and sinks in water. It is used for making ship's blocks, pulleys, rulers, and bowls. It is mainly grown as an ornamental tree in parks and gardens.

Gardening notes : Mostly propagated from seed. It is a slow-growing tree and thrives well under moist situations. Highly recommended for public parks and gardens.

56. THE NIGHT SHADE OR POTATO TREE

Solanum grandiflorum Ruiz & Pavon (Syn. *S. urightii* Bench.)

Family : SOLANACEAE

The name *Solanum* is from the Latin *Solatium*, meaning comfort, relief or solace, because of the narcotic properties. *Wrightii* is after Charles Wright (1811-85), an American naturalist who collected it in Hong Kong. *S. urightii* is conspecific with *S. grandiflorum*.

Distribution : Native of South America (Bolivia, Peru).

Description : It is a shrub or small tree, 30 to 40 feet high, with bluish-violet large flowers, arranged in simple or branched bunches. The flowers fade into mauve-white, and thus the tree has a mixture of flowers, purple blue and of lighter shades. The tree blooms all the year round. The leaf is heart-shaped, egg-shaped or lance-to elliptically lance-shaped with deeply cut lobes, with the underside hairy, and having long prickles. Cultivated in gardens for its showy flowers and ornamental foliage. The fruit is rounded and of the size of a golf ball.

Gardening notes : Propagated from seed or cuttings. Thrives best in sheltered and partially shaded places and grows even up to thirty feet or higher in situations sheltered from strong winds. It is one of the few trees which flower all the year round. Excellent for planting in compounds of houses as well as in public parks.

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This book tells the lay reader all about our different flowering trees—where they are found, how they are grown, what are the unique features of each, and how best they could be integrated into the modern landscape of concrete and glass. In the context of the present day efforts to improve the quality of man's environment, this is a timely book, which would interest the architect, the town planner, as well as the simple lover of nature and plants.

The author, Dr. M. S. RANDHAWA, has to his credit over 30 books in English, Hindi and Punjabi on such diverse subjects as science, art and culture. His books on Pahari miniature paintings are among the most authoritative works in the field. As the Vice-president of the Indian Council of Agricultural Research, he initiated a programme for publication of technical books and popular literature on various aspects of Indian agriculture.

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